

N18 Gort to Crusheen Road Scheme

transport21
progress in motion

NDP
National Development Plan 2007 - 2013

Department of Transport
An tSeirbhís Iompair


EUROPEAN UNION
STRUCTURAL FUNDS

NRA
National Roads Authority
An tUdairís um Bóithre Náisiúnta



Site Name: Rathwilladoon 4

Ministerial Direction No.: 044
Excavation Registration No.: E3655

Burnt Mound

Final Report

On behalf of Galway County Council

Site Director: Ed Lyne
November 2009

IAC Irish Archaeological
Consultancy

PROJECT DETAILS

Project Reference No.	A044
Project	N18 Gort to Crusheen Road Scheme
Ministerial Direction Reference No.	A044
NMS Registration Number	E3655
Excavation Director	Ed Lyne
Senior Archaeologist	Shane Delaney
Consultant	Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow
Client	Galway County Council
Site Name	Rathwilladoon 4
Site Type	Burnt Mound
Townland	Rathwilladoon
Parish	Beagh
County	Galway
NGR (Easting)	141150
NGR (Northing)	193931
Chainage	11880
Height m OD	26 m OD
RMP No.	N/A
Excavation Dates	10 – 18 October 2007
Excavation Duration	8 Days
Report Type	Final
Report Date	23 November 2009
Report By	Ed Lyne and IAC Ltd

ACKNOWLEDGEMENTS

The excavation was carried out in accordance with the Directions issued to Galway County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and the terms of the Contract between Galway County Council and Irish Archaeological Consultancy Ltd.

CONSULTING ENGINEERS

Project Director – David Cattley, Jacobs Engineering
Senior Engineer – David Lea, Jacobs Engineering
Resident Engineer – Ian Falconer, Jacobs Engineering

NRDO GALWAY COUNTY COUNCIL

Project Engineer – Fintan O’Meara
Project Archaeologist – Jerry O’Sullivan

NATIONAL MONUMENTS DIVISION, DEHLG

Archaeologist – Martin Reid

IRISH ANTIQUITIES DIVISION, NATIONAL MUSEUM OF IRELAND

REPORT PRODUCTION

Report Formatting and Editing – Ed Lyne, Shane Delaney and Maeve Tobin
Report Research – Ed Lyne, Shane Delaney, Mary-Liz McCarthy and Eimear O’Connor

ABSTRACT

Irish Archaeological Consultancy Ltd (IAC), funded by Galway County Council and the National Roads Authority (NRA), undertook the excavation of a burnt mound under Ministerial Directions at the site of Rathwilladoon 4 along the proposed N18 Gort to Crusheen road scheme (Figure 1). The following report describes the results of archaeological fieldwork at that site. The area was fully excavated by Ed Lyne under Ministerial Direction A044 and Registration Number E3655 issued by the Department of Environment, Heritage and Local Government (DEHLG) in consultation with the National Museum of Ireland. The fieldwork took place between 10 and 18 October 2007.

The burnt mound was located on the edge of wetland in Rathwilladoon, Co. Galway. The site was located at NGR 141150/193931 and was situated at 26 m OD. It was still visible on the surface as a grass-covered horseshoe-shaped mound. The part of the mound within the excavation area consisted of the 'back' of the mound. Upon removing the sod from the edge of the mound heat-affected stone and charcoal-rich soil was uncovered. When this material was removed, it was revealed that the mound sat on a pale grey, silty clay, natural geological deposit. Some possible features were revealed beneath the mound material. Following excavation it was considered that only one of these, a small linear feature, was in fact likely to be archaeological. The other features, given their irregular nature, probably represented tree holes that contained some mound material as a result of tree roots disturbing the mound in the past.

A fragment of alder/hazel charcoal from the burnt mound returned a 2 Sigma calibrated date of 1601–1436 BC (3231±22 BP: UBA 12737), placing the site in the early to middle Bronze Age period.

A post-medieval field boundary and furrows were also recorded on site. These were on the edge of the better quality land to the northwest of the mound and were of no archaeological significance. It is likely that any trough or pits associated with this mound remain untouched outside the area of development, in the opening of the horseshoe shaped mound.

CONTENTS

1	INTRODUCTION	1
1.1	General.....	1
1.2	The Development.....	1
1.3	Archaeological Requirements.....	1
1.4	Methodology.....	2
2	EXCAVATION RESULTS	3
2.1	Phase 1: Natural Drift Geology.....	3
2.2	Phase 2: Bronze Age Activity.....	3
2.2.1	Linear Feature.....	3
2.2.2	Burnt Mound.....	3
2.3	Phase 3: Post-Medieval Features.....	4
2.3.1	Ditch C5.....	4
2.3.2	Agricultural Furrows.....	4
2.3.3	Tree Hole.....	5
2.4	Phase 4: Topsoil.....	5
3	SYNTHESIS AND DISCUSSION	6
3.1	Landscape Setting.....	6
3.2	Bronze Age Archaeological Landscape.....	6
3.3	Typology of Burnt Mounds.....	10
3.4	Discussion.....	10
3.4.1	Phase 1: Natural Drift Geology.....	11
3.4.2	Phase 2: Bronze Age Activity.....	11
3.4.3	Phase 3: Post-Medieval Features.....	12
3.4.4	Phase 4: Topsoil.....	12
4	CONCLUSIONS	13
5	BIBLIOGRAPHY	14
5.1	References.....	14
5.2	Other Sources.....	16
	PLATES	18
APPENDIX 1	CATALOGUE OF PRIMARY DATA	I
Appendix 1.1	Context Register.....	i
Appendix 1.2	Catalogue of Artefacts.....	iii
Appendix 1.3	Catalogue of Ecofacts.....	iii
1.3.1	Charcoal.....	iii
Appendix 1.4	Archive Checklist.....	iv
APPENDIX 2	SPECIALIST REPORTS	V
Appendix 2.1	Radiocarbon Dating Results – QUB Laboratory.....	vii
Appendix 2.2	Environmental Report – Sarah Cobain.....	ix
Appendix 2.3	Petrological Analysis – Stephen Mandal.....	xxix
APPENDIX 3	LIST OF RMP SITES IN AREA	XXXVI
APPENDIX 4	LIST OF N18 GORT TO CRUSHEEN SCHEME SITE NAMES	XXXVII
	FIGURES	

Deleted: XXXVI

Deleted: XXXVII

Deleted: XXXVII

Deleted: XXXVIII

List of Plates

- Plate 1: Mound C3, pre-excavation, facing southeast
- Plate 2: Cut of drain C16, post-excavation view
- Plate 3: Post-excavation view of Rathwilladoon 4, facing southeast
- Plate 4: Ditch terminal C5, post-excavation
- Plate 5: Furrows, post-excavation, facing south
- Plate 6: Tree hole C8, post-excavation

List of Figures

- Figure 1: Rathwilladoon 4 site location on OSI Discovery Series background
- Figure 2: Rathwilladoon 4 showing Recorded Monuments with OSI background
- Figure 3: Rathwilladoon 4 post-excavation plan
- Figure 4: Northwest-facing section of C3 (burnt mound)
- Figure 5: Rathwilladoon 4 sections

1 INTRODUCTION

1.1 General

This report describes the excavation of Rathwilladoon 4 (Figures 1–3), in the townland of Rathwilladoon, undertaken by Ed Lyne of IAC Ltd, on behalf of Galway County Council and the NRA. It was carried out as part of the archaeological mitigation programme of the N18 Gort to Crusheen road scheme. The excavation was undertaken to offset the adverse impact of road construction on known and potential subsoil archaeological remains in order to preserve the site by record.

The site was not a Recorded Monument but was first identified in the EIA (Babtie Pettit Ltd 2006) and was subject to test excavations carried out by Dave Bayley in summer 2007 (Ministerial Direction No. A044, NMS Licence No. 07E0467). All features identified during the assessment phase were subsequently re-identified and excavated during the full excavation phase of the site which took place between 10 and 18 October 2007 with a team of 1 director, 1 supervisor and 6 assistant archaeologists.

The site was located approximately 750 m south of Tubber crossroads (Galway OS sheets 128).

The site was assigned the following identification data:

Site Name: Rathwilladoon 4; Ministerial Direction No.: A044; NMS Registration No.: E3655; Route Chainage (Ch): 11880; NGR: 141150/193931.

1.2 The Development

The N18 Gort to Crusheen scheme involves the construction of a total of 44 km of road to include mainline roadworks (22 km), associated side roads (10 km) and access tracks (12 km). The road will have twin 7 m carriageways, 2.5 m hard shoulders adjacent to the verges and a median with a minimum width of 2.6 m which includes two 1 m hard strips. The selected route bypasses the town of Gort to the east and the village of Crusheen to the west.

1.3 Archaeological Requirements

The archaeological requirements for the N18 Gort to Crusheen road scheme were defined in the Ministerial Directions issued to Galway County Council by the Minister for Environment, Heritage and Local Government under Section 14A (2) of the National Monuments Acts 1930–2004 and in the terms of the contract between Galway County Council and Irish Archaeological Consultancy Ltd. These instructions formed the basis of all archaeological works undertaken for this development. The archaeological excavation works under this contract were located between the townlands of Glenbrack, Co. Galway, and Carrowdotia, Co. Clare.

The proposed N18 was subjected to an Environmental Impact Assessment, the archaeology and cultural history section of which was carried out by Babtie Pettit Ltd in 2006. The Record of Monuments and Places, the Sites and Monuments Record, Topographical Files of the National Museum of Ireland, aerial photography, and documentary sources were all consulted. Two phases of geophysical survey were conducted. The main phase was by RSKENSR (Bartlett 2004) during the preparation of the EIA (Babtie Pettit Ltd 2006). A supplementary survey was carried out in Ballyboy by Target Geophysics Ltd (Target Geophysics Ltd 2007). As a result of the paper survey, field inspections, geophysical survey, archaeological testing and archaeological monitoring, a total of 22 fully recorded manual excavations were carried out on this section of the overall route alignment. In some cases where a

number of sites of similar type were located together in a single townland, the sites were excavated under one excavation number.

Phase 1 archaeological testing was completed by IAC Ltd and Phase 2 excavation of the sites identified during testing was conducted by IAC Ltd on behalf of Galway County Council and the NRA.

1.4 Methodology

A site grid was set up at 10m intervals and was subsequently calibrated to the national grid using GPS survey equipment. The sod and topsoil were removed by hand to reveal the mound.

All features were subsequently fully excavated by hand and recorded using the single context recording system with plans and sections being produced at a scale of 1:50, 1:20 or 1:10 as appropriate.

A complete photographic record was maintained throughout the excavation. Digital photographs were taken of all features and of work in progress.

An environmental strategy was devised at the beginning of the excavation. Features exhibiting large amounts of carbonised material were targeted. Animal bone, unburnt wood and stone samples were all retrieved through both hand and bulk collection and retained for specialist analysis wherever they were encountered during the excavations.

In the instances where artefacts were uncovered on site they were dealt with in accordance with guidelines issued by the National Museum of Ireland (NMI) and where warranted in consultation with the relevant specialists. All artefacts, ecofacts and paper archive are currently stored in IAC offices, Lismore, Co Waterford and will ultimately be deposited with the National Museum of Ireland.

Radiocarbon dating of the site was carried out by means of AMS (Accelerator Mass Spectrometry) dating of identified and recommended charcoal samples. All calibrated AMS dates in this report are quoted to 2 Sigma.

All excavation and post-excavation works were carried out in consultation and agreement with the Project Archaeologist, the National Monuments Section of the DEHLG and the National Museum of Ireland.

2 EXCAVATION RESULTS

The archaeological activity recorded at Rathwilladoon 4 consisted of an early to middle Bronze Age burnt mound.

Detailed descriptions of all excavated features and deposits are listed in Appendix 1.

2.1 Phase 1: Natural Drift Geology

Most of the low-lying areas along the route are associated with poorly drained, bog and wet marshland areas of glacially formed depressions and seasonal lakes known as turloughs. The higher ground generally comprises well-drained, gently undulating pastureland with some uneven hummocky ridges, formed either of limestone epikarst or glacial features such as drumlins. The two dominant rock types of the region are Carboniferous Limestone, which underlies the entire length of the N18 Gort to Crusheen scheme, and Devonian Old Red Sandstone, which forms the Slieve Aughty Mountains to the east of the proposed route. The road alignment is predominantly underlain by either limestone-derived till and sandy till deposited during the last glaciation or organic peat which has generally formed in the low-lying, poorly drained areas where standing water and slow percolation causes thin layers of peaty soil to accumulate.

Rathwilladoon 4 was located on the edge of wetland to the east and was overlooked to the west by a very steep slope leading to a north/south orientated ridge. The natural subsoil on this site consisted of pale grey, sandy clay, with some stone inclusions. It was cut by or sealed by all subsequent archaeological activity. The Ordnance Survey first edition mapping has the area of the site depicted on the edge of a small lake called Loughannirra. This small lough is now bog. A little further south is Scarriff lough and this whole low-lying area was prone to flooding.

2.2 Phase 2: Bronze Age Activity

The prehistoric activity on site consisted of a burnt mound and a single linear feature which was sealed by the burnt mound (Figure 3; Plate 1).

2.2.1 Linear Feature

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
11	16	1.1	0.5	0.1	Charcoal rich silt	Fill of cut 16
16	N/A	1.1	0.5	0.1	Linear cut, gradual sides	Cut of drain

Finds: None

Interpretation

C16 was a linear feature, similar in shape to a furrow, but sealed by the burnt mound C3 (Figure 3; Plate 2). The cut was u shaped in profile with a gradual break of slope at top and curving sides with an imperceptible break of slope at the base. It was filled with charcoal-rich silt. It extended east outside of the CPO corridor. It may have functioned as a drain prior to the establishment of the burnt mound as it was sloping towards the wetland, however this is not certain.

2.2.2 Burnt Mound

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
3	N/A	10	10	0.2	Grey black material, burnt stones, charcoal	Burnt mound
15	N/A	12	0.6	0.08	Dark grey sandy silt, charcoal, stones	Disturbed material

Finds: None

Interpretation

The mound (C3) comprised of burnt angular stones and charcoal and extended in a horseshoe shape for 10 m north to south and approximately 10 m east to west. It was approximately 0.20 m deep where excavated. A secondary layer (C15) was recorded extending from it which represented material washed out of the mound and contained small stones and a charcoal-flecked silt (Figures 3–4; Plate 1). The hollow area at the centre of the mound will not be impacted upon by the road works and was not excavated.

One AMS date was obtained from the mound deposit C3. A fragment (1.7 g) of alder/hazel (*Alnus glutinosa/Corylus avellana*) charcoal was identified (Cobain, Appendix 2.2). This charcoal returned an AMS result of 3231±22 BP (UBA 12737). The 2 Sigma calibrated result for this was 1601-1436 BC (Appendix 2.1). The burnt mound also contained oak, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal and a single carbonised hazelnut shell inclusion. The stones discarded in the mound were heat-altered limestone (Mandal, Appendix 2.3).

2.3 Phase 3: Post-Medieval Features

The post-medieval activity on site consisted of the western end of a drainage or boundary ditch which appeared to run towards the area of wetland located to the southeast of the burnt mound, and a series of seven furrows which were located to the northwest of the burnt mound, on the drier uphill side of the site.

2.3.1 Ditch C5

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
4	C5	2.62	2.4	0.17	Dark brown sandy clay, stones	Secondary fill of ditch
5	N/A	2.63	2.4	0.42	Linear cut, steep to gradual sides	Drainage/boundary ditch
6	C5	1.97	1.9	0.22	Brown grey sandy clay, charcoal, stones	Primary fill of ditch

Finds: None

Interpretation

The linear cut C5, consisted of the terminal of a northwest to southeast orientated boundary ditch which was located at the northeast edge of Rathwilladoon 4 (Figures 3 and 5; Plate 4). It is likely to be post-medieval in date. The boundary ditch is shown on the first edition Ordnance Survey mapping (1840). The stones from the fill were decayed (not burnt) and were limestone, chert, coarse grained quartzite and sandstone (Mandal, Appendix 2.3).

2.3.2 Agricultural Furrows

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
12	C25	Unknown	0.43	0.04	Greyish brown sandy clay, pebbles	Fill of a furrow
13	N/A	over 3	0.6	0.08	Linear cut, gradual sides	Cut of a furrow
14	C13	over 3	0.6	0.08	Greyish brown silty sand, stones	Fill of a furrow
17	C18	2.4	0.4	0.1	Grey silty sand, stones, charcoal	Fill of a furrow
18	N/A	2.4	0.4	0.1	Linear cut, gradual sides	Cut of a furrow
19	N/A	5	0.5	0.12	Linear cut, gradual sides	Cut of a furrow
20	C19	5	0.5	0.12	Greyish brown sandy clay, pebble	Fill of a furrow
21	N/A	4.4	0.55	0.1	Linear cut, gradual sides	Cut of a furrow
22	C21	4.4	0.55	0.1	Grey silty sand, stones, charcoal	Fill of a furrow
23	N/A	3.1	0.34	0.1	Linear cut, gradual sides	Cut of a furrow

24	C23	3.1	0.34	0.1	Grey silty sand, stones, charcoal	Fill of a furrow
25	N/A	Unknown	0.43	0.04	Linear cut, gradual sides	Cut of a furrow
26	N/A	Unknown	1.05	0.17	Linear cut, moderate sides	Cut of a furrow
27	C26	Unknown	1.05	0.17	Grey sandy clay, pebbles	Fill of a furrow

Finds: None

Interpretation

The above contexts consist of the cut and fills of seven furrows, C13, C18, C19, C21, C23, C25, and C26 that were recorded on site. These ran north to south and lay to the northwest of the burnt mound, and seemed to respect the burnt mound (Figures 3; Plate 5). They are most likely post-medieval in date.

The furrows were spaced approximately 1 m apart and were located within a small area between the burnt mound and the established and mature field boundary. It is likely that they were spade dug.

2.3.3 Tree Hole

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
7	N/A	1.05	1.43	0.5	Compact greyish/black stony material	Fill of tree hole
8	N/A	N/A	N/A	N/A	Irregular sub-oval cut	Tree hole
9	N/A	1	1.5	0.24	Dark grey silty clay with occasional stones	Fill of tree hole

Finds: None

Interpretation

The above contexts consist of a feature, C8, which was initially thought to be archaeological in nature, but following excavation it was felt based on its form that it was the result of tree-root action and of no archaeological significance (Figures 3 and 5)). It seemed that a tree had grown on the edge of the mound at some stage, and had pulled some of the mound material into its tree hole (Plate 6).

2.4 Phase 4: Topsoil

Context	Fill of	L(m)	W(m)	D(m)	Basic Description	Interpretation
1	N/A	Site	Site	0.25	Layer of dark brown sandy clay	Topsoil

Finds: None

Interpretation

All of the archaeological features and the natural subsoil layers were sealed by topsoil. It was approximately 0.25 m in depth across the site. No finds were recovered from the site.

3 SYNTHESIS AND DISCUSSION

3.1 Landscape Setting

Most of the low-lying areas along the route were associated with poorly drained bog and wet marshland which have developed within glacially formed depressions and seasonal lakes known as turloughs. The higher ground generally comprised well-drained, gently undulating pastureland with some uneven hummocky ridges, formed either of limestone epikarst or glacial features such as drumlins. The two dominant rock types of the region Carboniferous Limestone, which underlay the entire length of the N18 Gort to Crusheen scheme, and Devonian Old Red Sandstone, which formed the Slieve Aughty Mountains to the east of the project. The road alignment was predominantly underlain by either limestone and sand derived till deposited during the last glaciation or organic peat which has generally formed since then in the low-lying, poorly drained areas where standing water and slow percolation caused thin layers of peaty soil to accumulate.

The burnt mound was located on the edge of wetland in Rathwilladoon, Co. Galway. The site was located at NGR 141150/193931 and was situated at 26 m OD. It was still visible on the surface as a grass-covered horseshoe-shaped mound. The part of the mound within the excavation area consisted of the back of the mound. The site was located at the base of a steep east-facing slope. A graveyard (GA0128-069) and ringfort (GA0128-070) with associated souterrain (GA128-07001) are located c. 200 m north of Rathwilladoon 4.

3.2 Bronze Age Archaeological Landscape

Following the test excavation phase of the project it was apparent that most of the archaeological sites identified were located at the south end of the scheme in County Clare. This trend appears to have resulted from landscape management in the recent past where the better drained lands to the north have been improved and the fields enlarged which would have had a negative effect on any buried archaeological sites. However, the area to the south, which coincides with crossing the county border, was of more marginal land prone to flooding and in this area the route of the new road tended to follow wet valley floors and steep valley slopes. The landscape encountered in County Clare was much the same as it was depicted on the first edition Ordnance Survey maps (1842).

As with the transition from the Mesolithic to Neolithic periods, the transition to the Early Bronze Age period brought with it many changes to society. In County Clare and particularly in the northwest of the county in the Burren, where there is a highly visible prehistoric landscape due to the exposed bare rock nature of the terrain, the large number of prehistoric sites, including c. 80 wedge tombs (Jones 2004, 65), indicates a well organised late Neolithic/early Bronze Age landscape. The transition from the Neolithic to the Bronze Age reflects a continued and somewhat intensified population in north and east Clare. It is during this period that megalithic monuments were abandoned in favour of individual cist or pit burials, either located in isolation or in small cemeteries. Different forms of barrow monuments were also being constructed during the period, as well as ceremonial monuments such as circular henges, standing stones, stone rows and stone circles. A current research project in the Burren has also recorded middle and late Bronze Age ritual funerary deposition in Glencurran Cave, Co. Clare (Dowd 2007).

In recent years Bronze Age habitation sites have come more to the fore as they have been uncovered as part of development-led or infrastructural projects. They are well documented elsewhere but two interesting, recently excavated sites include Bronze Age roundhouses at Tober 1, County Offaly (Walsh 2009) and Barnhill, Dromoland,

Co. Clare (Moore Group 2009). An important academic study of the spatial organisation of Bronze Age society and landscape has been undertaken of the north Munster area and in county Clare this is defined by the work undertaken by Grogan on the Bronze Age trivallate hillfort at Mooghaun (Grogan 2005). This study identified and mapped a Bronze Age landscape dominated by the hillfort which may have influenced a catchment area of up to 450 km sq (Grogan 2005, 95). Identified within the area of influence were ceremonial monuments, house sites, burnt mound sites and other more mundane features such as fish traps and trackways in the Fergus estuary (O'Sullivan and Dillon 2005). The Mooghaun study area is outside the sphere of influence of sites identified on the Gort to Crusheen scheme but indicates nonetheless that a similar societal organisation of the landscape may have existed for them too. A hoard of gold objects discovered at Mooghaun during the construction of the Limerick – Ennis railway in 1854 is one of the largest single discoveries of Bronze Age gold in Europe (Grogan 2005, 70). Another significant gold find from the north of the county was the Gleninsheen gorget, a large collar of hammered gold discovered by a farmer in 1932 (Jones 2004, 74).

The most widespread sites from the Bronze Age are burnt mounds (also known as *fulachta fiadh*). They survive as low mounds of charcoal-rich soil mixed with heat-shattered stones. They are usually horseshoe shaped, located in low-lying areas near a water source and are often found in clusters. While it is generally thought that they were probably used as cooking places (Ó Drisceóil 1988), finds from excavated examples, where there is a noteworthy absence of animal bone, do not support this theory. Lucas (1965) suggested that burnt mounds might have been used for processes such as bulk washing, dyeing and leather working while Barfield and Hodder (1987) have suggested that such sites were covered by light structures and used as sweat houses. Radiocarbon dates for this monument type have generally placed them in the Bronze Age (Brindley et al. 1990, 55) though evidence from early Irish texts (Ó Drisceóil 1988) suggest use of this type of site up until the 16th century AD.

Burnt mounds make up a significant number of the Recorded Monuments within the immediate vicinity of the Gort to Crusheen road scheme and following examination of a one kilometre wide corridor, using the road as the centreline, of the scheme, these classic elements of the Bronze Age landscape became apparent. Within this defined corridor there were no recorded burnt mounds in south County Galway, whereas north County Clare was rich in the monument-type: RMP sites CL018-069, CL018-071, CL018-072, CL018-077, CL018-084, CL018-082, CL018-083, CL018-086, CL026-143, CL026-130, CL026-131, CL026-136, CL026-138, CL026-137, CL026-134, CL026-135, 02E1284 partly excavated as part of Bord Gáis Éireann's pipeline to the west at Bearnafunshin (Dennehy 2002a), 02E0342 excavated as part of Bord Gáis Éireann's pipeline to the west at Bearnafunshin (Halpin 2002)., CL026-149, CL026-150, CL026-151, CL026-156, CL026-157, CL026-158, CL026-165, CL026-164, and Site AR25 Carrowdotia (Taylor 2006a). There appeared to be a tendency in the sites identified for clustering, often within 100 m or less of each other.

Single upright standing stones are a common feature of the Irish landscape and, though they may date to different periods and serve different functions, excavation has shown that some may mark prehistoric burials, while some may signify a route-way, a boundary, or serve a commemorative role. Generally speaking, it is likely that a large number date to the Bronze Age. The orientation of a stone may have had significance, with their long axes aligned to another stone or toward a cairn on a mountain top, although the latter is difficult to prove. A standing stone (RMP CL026-035) has been identified c. 150 m southeast of the southern end of the route.

Ring barrows consist of a low, usually circular mound or level area enclosed by a fosse and external bank, the diameter of the earthwork usually ranging between 4 m and 12 m and rarely exceeding 1 m in height or depth. Excavation has demonstrated that they usually sealed a burial deposit, often a cremation. Such forms of burial have a long tradition and individual examples have been assigned to the Neolithic, Bronze and Iron Ages. A ring barrow (Dennehy 2002b) was identified during monitoring of Bord Gáis Éireann's pipeline at Cloonagowan, Co. Clare. The archaeological remains represented a cremation pit with a ring ditch. Pits, stakeholes and a slot trench were identified within the ring ditch, with some pits indicating a probable domestic function. A second cremation pit was identified c. 75 m to the northeast, with an isolated posthole, which may have acted as a marker for the cremation pits, located further to the northeast. A single thumbnail scraper was recovered from the site, enabling rough dating to the late Neolithic/early Bronze Age period (Dennehy 2002c). A single possibly Bronze Age cremation pit and industrial pits were identified during the monitoring of Bord Gáis Éireann's pipeline in Gortaficka (Dennehy and Sutton 2002). A wedge tomb (CL026-015) is located less than 500 m northeast of a concentration of burnt mounds and spreads which surround a peat bog, and were excavated as part of the N18 Gort to Crusheen road scheme, in Caheraphuca townland. The wedge tomb is also likely to date to the late Neolithic or early Bronze Age.

Our appreciation of the wider Bronze Age landscape in counties Clare and Galway is continually being expanded as more sites are being uncovered during research, development-led and infrastructural projects such as the N18 road scheme. Excavations connected with construction of the N18 to the north (Gort to Oranmore) which is entirely within County Galway, has also recently produced evidence for the Bronze Age with eight burnt mound sites identified: one at Ballyglass West, a cluster in Caherweelder townland and further examples in Moyveela and Coldwood (Eachtra 2009).

Excavations undertaken by TVAS (Ireland) Ltd in 2003 in advance of construction of the N18 Ennis Bypass and N85 Western Relief Road, which terminated at the southern end of the N18 Gort to Crusheen road scheme revealed similar archaeological sites. This area was generally better drained and the variety of Bronze Age sites encountered during that project reflects the change in terrain. The marginal lands and areas closest to wetlands, rivers and streams produced evidence for burnt mounds such as the four burnt mound sites identified at Clare Abbey (Hull 2006a and b, Taylor 2006c and d) close to the Ardsollus river (a tributary of the Fergus). Burnt mound sites were also excavated at Killow (Taylor 2006b), Cahircalla More (Taylor 2006e) and Carrowdotia (Taylor 2006a) to the south of the Gort to Crusheen project. Apart from the burnt mound sites a number of funerary sites were also identified on the N18 Ennis Bypass and N85 Western Relief Road. Two cremation cemetery sites were identified in Manusmore townland (Hull 2006c and 2006d); both were located on slightly elevated free draining gravel ridges. A third site with cremation pits was identified at Killow (Taylor 2006b) in close proximity to a burnt mound; it was located on a low but well-drained gravel drumlin.

The landscape of County Clare is rich in sites dating to the Bronze Age, indicating that the area was widely inhabited during that period. Burnt mounds are the most frequent site of Bronze Age date encountered in this area of Clare, with twenty seven identified within the immediate area of the road scheme. There are no burnt mounds recorded within the tight constraints of the study area for Co. Galway but there are examples in the wider surrounding area and they were also located in the excavations on the N18 contract further to the north. The archaeological evidence to date indicates that the study area and indeed its wider landscape was inhabited throughout the entire Bronze Age period.

Bronze Age Rathwilladoon 4

Rathwilladoon 4 was an undisturbed horseshoe-shaped mound of heat-shattered stone. Limited excavation was carried out at the site as most of it lay outside of the CPO. The trough was not identified but it is likely that it is in the area outside the CPO. Charcoal from the site has returned a 2 sigma date range of 1601–1436 BC (3231±22 BP: UBA12737) (Appendix 2.1).

Similar parallels in terms of morphology and dating to the Bronze Age were identified and excavated across the project. Sites excavated across the scheme were generally identified as simple spreads or mounds of burnt and heat-shattered stone. While some of these, like the one at Drumminacloghaun 1 (McNamara 2009c), had evidence for a simple earth-cut trough, other sites such as those at Gortavoher 1 (Delaney 2009b) and Caheraphuca 10 (Bayley 2009c) were represented simply by spreads of heat-shattered stone.

Isolated burnt mounds sites identified along the project were Rathwilladoon 4, Drumminacloghaun 1 (McNamara 2009c) and Clooneen 1 (Bayley 2009a). As the route travelled further south it tended to follow marginal wetland and stream valleys and the burnt mounds appeared to become more clustered. This clustering of sites was identified at Curtaun 1 and 2 (Delaney 2009a), Gortavoher/Monreagh (Delaney 2009b and c, McNamara 2009a), Derrygarraff (Nunan 2009a), Sranagalloon/Gortaficka (Nunan 2009b, 2009c and 2009d), Caheraphuca (Bayley 2009b and 2009c) and Ballyline (McNamara 2009b). A similar pattern of clustered burnt mounds to the south in County Clare and a paucity of examples of burnt mounds in County Galway was also encountered during the construction of Bord Gáis Éireann pipeline (Grogan et al. 2007). The AMS dating indicates however that the sites were not necessarily contemporary but rather spanned the entire Bronze Age period and extended into the Iron Age (with one example at Derrygarraff 1 possibly indicating a medieval date) illustrating how the process of this pyrolithic technology remained the same across thousands of years.

More elaborate examples of troughs and pits from across the project (though serving the same function) displayed evidence for timber lining through the identification of stakeholes for upright supports at Curtaun (Delaney 2009a), Caheraphuca 1 (Bayley 2009b) and Gortaficka 1 and 2 (Nunan 2009d) and in some cases the actual remains of timber lining as at Clooneen 1 (Bayley 2009a), Caheraphuca 4 (Bayley 2009c) and Sranagalloon 3 (Nunan 2009c). Although the primary function of these sites was to heat water through the use of hot stones the actual purpose remains unknown. The sites at Caheraphuca 1 and Gortaficka 2 both displayed evidence for numerous troughs, drains, hearths and possibly preparation areas with stake-lined pits, suggesting that they may have been used for some more formal industrial function than the other sites.

Rathwilladoon 4 was located approximately 1.4 km to the south of the two burnt mounds at Curtaun (Delaney 2009a) and it was located approximately 900 m north of the cluster of burnt mounds at Gortavoher (Delaney 2009b) and Monreagh (Delaney 2009c, McNamara 2009a). A review of the RMP records and the sites excavated as part of the N18 Gort to Crusheen road scheme indicate that the number of known or suspected burnt mounds increases south of Gortavoher which coincides with the townland, county and provincial border. It also represents a very distinct change in the landscape terrain.

3.3 Typology of Burnt Mounds

Burnt mound sites (also commonly referred to as *fulachta fiadh*) are one of the most common field monuments found in the Irish landscape. The last published survey (Power et al. 1997), carried out over a decade ago, recorded over 7,000 burnt mound sites and in excess of 1,000 sites have been excavated in recent years through development led archaeological investigations. In spite of this no clear understanding of the precise function of these sites has been forthcoming.

Burnt mound sites are typically located in areas where there is a readily available water source, often in proximity to a river or stream or in places with a high water table. In the field burnt mounds may be identified as charcoal-rich mounds or spreads of heat-shattered stones; however, in many cases the sites have been disturbed by later agricultural activity and are no longer visible on the field surface. Nevertheless, even disturbed spreads of burnt mound material often preserves the underlying associated features, such as troughs, pits and gullies, intact.

Ó Néill (2003–2004, 82) has aptly identified these sites as the apparatus and by-product of pyrolithic technology. This technology involved the heating or boiling of water by placing fire-heated stones into troughs of water. Small shallow round-bottomed pits, generally referred to as pot boiler pits or roasting pits, are often associated with burnt mound sites. The purpose of these pits remains unclear. Occasionally large pits are also identified and may have acted as wells or cisterns. Linear gullies may extend across the site, often linked to troughs and pits, and demonstrate a concern with onsite water management. Post and stakeholes are often found on burnt mound sites and these may represent the remains of small structures or wind breakers.

Burnt mound sites are principally Bronze Age monuments and reach their pinnacle of use in the middle/late Bronze Age (Brindley et al. 1989–90; Corlett 1997). Earlier sites, such as Enniscoffey Co. Westmeath (Grogan et al. 2007, 96), have been dated to the Neolithic and later sites, such as Peter Street, Co. Waterford (Walsh 1990, 47), have been dated to the medieval period. Thus although burnt mound sites generally form a components of the Bronze Age landscape, the use of pyrolithic technology has a long history in Ireland.

Although there is a general consensus that burnt mound sites are the result of pyrolithic technology for the heating or boiling of water, the precise function of these sites has, to date, not been agreed upon. Several theories have been proposed but no single theory has received unanimous support. The most enduring theory is that burnt mounds sites were used as cooking sites. O'Kelly (1954) and Lawless (1990) have demonstrated how joints of meat could be efficiently cooked in troughs of boiling water. The use of burnt mound sites for bathing or as saunas has been suggested as an alternative function (Lucas 1965; Barfield and Hodder 1987; Ó Drisceóil 1988). This proposal is largely influenced by references in the early Irish literature to sites of a similar character and is very difficult to prove, or disprove. Others, such as Jeffrey (1991), argue that they may have been centres of textile production for the fulling or dyeing of cloth. More recent demonstrations by Quinn and Moore (2007) have shown that troughs could have been used for brewing, however, this theory has been criticised by specialist environmentalists due to the absence of cereal remains from most burnt mound sites (McClatchie et al. 2007).

3.4 Discussion

The site comprised an early Bronze Age burnt mound. It was only partly excavated as the rest of the site lay outside of the area of landtake for the road.

3.4.1 Phase 1: Natural Drift Geology

This phase represents the natural subsoil, which was cut or sealed by all subsequent archaeological features. For the purposes of recording on-site this phase of activity was allocated the context number C2. Rathwilladoon 4 was located on the edge of wetland to the east and was overlooked to the west by a very steep slope leading to a north south oriented ridge. The natural subsoil on this site consisted of pale-grey, sandy clay, with some stone inclusions. The Ordnance Survey first edition mapping has the area of the site depicted on the edge of a small lake called Loughannirra. This small lough is now a bog. A little further south is Scarriff lough and this whole low lying area was prone to flooding.

3.4.2 Phase 2: Bronze Age Activity

The investigated Bronze Age activity at Rathwilladoon 4 consisted of a possible drain and a burnt mound. A sample of hazel/alder (Cobain, Appendix 2.2) charcoal retrieved from the burnt mound was selected for AMS radiocarbon dating and returned a date of 3231±22 BP (UBA 12737) (Appendix 2.1). The 2 Sigma calibrated result was 1601–1436 BC dating this deposit to the early to middle Bronze Age period.

Lab code	Context / sample	Sample material	Years BP	1 sigma	2 sigma
UBA 12737	C3 / S1	Charcoal Alder/ Hazel	3231±22	Cal 806-671 BC	Cal 817-551 BC

The burnt mound also contained oak, ash, *Maloideae* species (hawthorn/rowan/crab apple) and elm charcoal and a single carbonised hazelnut shell inclusion. The charcoal indicates that there was an oak/ash forest close by and that there was healthy woodland in the marginal areas of the wetland surrounding the site which provided the deadwood used for kindling in the fires.

One archaeological feature was exposed beneath the burnt mound. It extended under the mound and out of the area of the excavation. It was positioned to run downslope and may have been used as a drain prior to or during the lifetime of the functioning burnt mound. As the area that was excavated was limited and only the back of the horseshoe-shaped mound was investigated little of archaeological significance was identified. The mound was curved in a horseshoe shape with the central hollow outside the CPO area. This hollow would likely have been the location of the trough. It was located on the edge of a lake in prehistory, and the trough would have been cut into the water table to enable the trough to fill with water.

A sample of the heat-shattered stone from the burnt mound was identified as burnt limestone, which is not a typical stone associated with burnt mounds, though it does occur (Mandal, Appendix 2.4). Limestone is part of the underlying geology at Rathwilladoon and was visible on site as bedrock and would have been widely available in the environs of the site. It is not however, an ideal stone for use in a burnt mound as its ability to absorb heat is not as good as sandstone for example (ibid.). Therefore it is likely that it was chosen because of its widespread availability on site; or alternatively it was required for a specific function. If limestone is burnt at a high temperature it can fracture and reduce to quicklime. This is a skin irritant and can cause discomfort in the upper respiratory tract and major discomfort if ingested. If this is then added to water it produces calcium hydroxide (Ca (OH) 2); which produces similar symptoms (Irishlime.com). This suggests that this burnt mound site was not used for cooking or preparing food.

Calcium hydroxide has a number of known uses, one of which is in the preparation of hides for tanning. Once a hide or skin has been soaked in a solution of lime-rich water it can be stretched over a frame and de-haired and cleaned without fear of its

decomposing. Considering the lack of evidence for industry or food preparation at this site it is reasonable to offer tanning as a possible function of the site. This suggestion was previously put forward with regard to Williamstown 1, Co. Westmeath (A016-032 E2660) on the N6 road scheme, where limestone was also used as the main stone type in a burnt mound site (Lyne 2008). That site was dated to Cal 1600–1420 BC (3220±40 BP, Beta 249537), and so was contemporary with Rathwilladoon 4.

The closest excavated burnt mounds to Rathwilladoon 4 are Gortavoher 1 to the south, which has returned a date of 1871–1665 BC, and Curtaun to the north, which returned a date of 1608–1459 BC. These two sites date either side of the activity identified at Rathwilladoon 1.

3.4.3 Phase 3: Post-Medieval Features

The post-medieval activity on site consisted of the western end of a boundary ditch which appeared to run towards the area of wetland located to the southeast of the burnt mound, and a series of seven furrows which were located to the northwest of the burnt mound, on the drier uphill side of the site. The boundary ditch is shown on the first edition Ordnance Survey mapping. The furrows were spaced approximately 1 m apart and were located within a small area between the burnt mound and the established and mature field boundary. It is likely that they were spade dug as the distance between the field boundaries depicted on the Ordnance Survey first edition mapping and the lake at that time would not have been sufficient to manoeuvre a plough.

3.4.4 Phase 4: Topsoil

All of the archaeological features and the natural subsoil layers were sealed by topsoil. It was approximately 0.25 m in depth across the site. No finds were recovered from the site.

4 CONCLUSIONS

The prehistoric activity Rathwilladoon 4 consisted of a mound of heat-affected limestone, situated on the edge of an area of wetland (Figure 3). A layer of material washed out from this as a secondary deposit was also identified. The mound sealed a single linear archaeological feature, possibly a drain, which extended to the east downslope under the mound and outside the lands acquired for the road. Hazel/alder charcoal from the mound dated to 1601–1436 BC (2 Sigma calibration) placing the site in the early to middle Bronze Age period. The charcoal assemblage suggests that the site was surrounded by primary woodland comprising of a combination of oak-hazel-ash with a hazel understorey with scrubland type taxa such as hawthorn/rowan/crab apple.

The heat-shattered stone has been identified as limestone and in the light of a lack of any other evidence to suggest a use may indicate that the trough was used for tanning or a similar industrial function. The mound was largely situated outside the excavation area, and consequently only a small portion of it was excavated.

The post-medieval activity on site consisted of the western end of a boundary ditch (depicted on the first edition Ordnance Survey mapping) which appeared to run towards the area of wetland located to the southeast of the burnt mound, and a series of seven furrows that were located to the northwest of the burnt mound, on the drier uphill side of the site.

5 BIBLIOGRAPHY

5.1 References

- Babtie Pettit Ltd 2006 *Cultural Heritage Section of N18 Gort to Crusheen Scheme Environmental Impact Statement* undertaken on behalf of Galway County Council
- Bartlett, ADH 2004 N18 Gort to Crusheen Road Scheme: Report on Archaeogeophysical Survey of Proposed Route. RSKENSR, Helsby
- Barfield, L & Hodder, M 1987 'Burnt mounds as saunas and the prehistory of bathing'. *Antiquity* **64**, 370 – 379
- Bayley, D 2009a *Clooneen 1, E3722. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Bayley, D 2009b *Caheraphuca 1, E3654. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Bayley, D 2009c *Caheraphuca 3–12, E3653. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Brindley, A L; Lanting, J N and Mook, W G 1989–90 Radiocarbon dates from Irish *fulachta fiadh* and other burnt mounds, *Journal of Irish Archaeology* **5**, 25–33
- Corlett, C 1997 A *fulacht fiadh* site at Moynagh Lough, County Meath, *Ríocht na Mídhe* **9** (3), 46–49
- Delaney, S 2009a *Curtaun 1 & 2, E3721. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Delaney, S 2009b *Gortavoher 1, E3984. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Delaney, S 2009c *Monreagh 3, E4037. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Dennehy, E 2002a Bearnafunshin, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E 2002b Cloonagowan, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E 2002c Cloonagowan, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dennehy, E and Sutton, B. 2002 Gortaficka, Co Clare. In Bennett, I *Excavations 2002*. Wordwell, Bray
- Dowd, M 2007 Living and dying in Glencurran Cave. *Archaeology Ireland* **21** (1), 36–39
- Grogan, E O'Donnell, L and Johnston, P 2007 *The Bronze Age Landscapes of the Pipeline to the West*. Bray, Margaret Gowen and Co. Ltd and Wordwell

- Grogan, E 2005 The North Munster Project, Vol 1, The later prehistoric landscape of south-east Clare, *Discovery Programme Monographs* 6, Wordwell, Bray
- Grogan, E Condit, T O'Carroll, F O'Sullivan, A and Daly, A 1996 Tracing the Late Prehistoric landscape in North Munster, *Discovery Programme Reports* 4, 26–46 Dublin
- Halpin, B 2002 Bearnafunshin, Co Clare. In Bennett, I *Excavations 2002*: Wordwell, Bray
- Hull, G 2006a Site AR124, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006b Site AR125, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006c Site AR100, Manusmore, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Hull, G 2006d Site AR102, Manusmore, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd
- Jeffrey, S 1991 Burnt mounds, fulling and early textiles? In M Hodder and L Barfield (eds), *Burnt mounds and hot stone technology*. Sandwell Metropolitan Borough Council, 97–102
- Jones, C 2004 *The Burren and the Aran Islands—Exploring the Archaeology*. Collins Press, Cork
- Lawless, C 1990 A *fulacht fiadh* Bronze Age cooking experiment at Turlough, Castlebar, *Cathair na Mart* 10, 1-10
- Lucas, A T 1965 Washing and bathing in ancient Ireland, *JRSAI* 96, 65–114
- Lyne, E 2008 *Williamstown 1, E2660. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McClatchie, M Brewer, A Dillon, M Johnston, P Lyons, S Monk, M Stewart, K and Timpany, S 2007 Brewing and fulachta fiadh. *Archaeology Ireland* 21 (4), 46
- McNamara, S 2009a *Monreagh 1 & 2, E3712. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McNamara, S 2009b *Ballyline 1 & 2, E3717. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- McNamara, S 2009c *Drumminacloghaun 1, E3720. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Nunan, J 2009a *Derrygarriff 1, E3710. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd
- Nunan, J 2009b *Sranagalloon 1, E3713. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Nunan, J 2009c *Sranagalloon 3, E3897. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Nunan, J 2009d *Gortaficka 1 & 2, E3898. Final Report*. Unpublished report prepared for Irish Archaeological Consultancy Ltd

Ó Drisceóil, D A 1988 Burnt mounds: cooking or bathing, *Antiquity*, **62**, 671–680

O' Kelly, M J 1954 Excavations and experiments in ancient Irish cooking-places, *JRSAI*, **84**, 105–155

Ó Néill, J 2003–2004 *Lapidibus in igne calefactis coquebatur*. The historical burnt mound 'tradition', *The Journal of Irish Archaeology* **12–13**, 79–85

O'Sullivan, A and Dillon, M 2005 *Intertidal archaeological survey of Bronze Age structures and medieval fishtraps on the Fergus estuary, Co. Clare*. UCD School of Archaeology, Dublin

Power, D Byrne, E Egan, U Land, S and Sleeman, M 1997 *Archaeological inventory of County Cork. Volume III–Mid Cork*. Dublin

Quinn, B and Moore, D 2007 Ale, brewing and *fulachta fiadh*, *Archaeology Ireland* **21** (3), 8–10

Target Geophysics Ltd. 2007. A Geophysical Survey at Ballyboy, Co. Galway. Unpublished Report

Taylor, K 2006a Site AR25, Carrowdotia, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006b Site AR104, Killow, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006c Site AR121, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006d Site AR122, Clare Abbey, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Taylor, K 2006e Site AR127, Cahircalla More, Co Clare. Final Archaeological Excavation Report for Clare County Council. TVAS Ireland Ltd

Walsh, C 1990 A Medieval Cooking Trough from Peter Street, Waterford in Buckley, V (ed.), *Burnt Offerings: International Contributions to Burnt Mound Archaeology*, 47–48., Wordwell. Bray

Walsh, F 2009 Site A016/051; E2677: Tober 1, Tober, County Offaly. Unpublished report prepared by Irish Archaeological Consultancy Ltd

5.2 Other Sources

Record of Monuments and Places (RMP), The Department of the Environment, Heritage and Local Government, 7 Ely Place Upper, Dublin 2

Topographical Files of the National Museum of Ireland, Kildare Street, Dublin 2

Cartographic References

Ordnance Survey. *Map Editions* (1840, 1899, 1915).

Electronic References

<http://eachtra.ie/index.php/journal/n18-oranmore-gort/>

<http://excavations.ie>

<http://www.irishlime.com/pfds/Hydrated%20Lime%20MSDS.pdf>

<http://mooregroup.wordpress.com/2009/02/04/bronze-age-roundhouse-in-clare>

PLATES



Plate 1 Mound C3, pre-excitation, facing southeast



Plate 2 Cut of drain C16, post-excitation view



Plate 3 Post-excitation view of Rathwilladoon 4, facing southeast



Plate 4 Ditch terminal C5, post-excitation



Plate 5 Furrows, post-excitation, facing south



Plate 6 Tree hole C8, post-excitation

APPENDIX 1 CATALOGUE OF PRIMARY DATA

Appendix 1.1 Context Register

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Findings	Context Above	Context Below
1	N/A				Topsoil	Layer of dark brown sandy clay.	N/A		
2	N/A				Natural subsoil	Pale grey sandy clay	N/A		
3	N/A	10	10	0.2	Burnt mound.	Compact grey black stony burnt mound material. Frequent sub angular stones.	N/A	C1	C7
4	C5	2.62	2.4	0.17	Probable drainage feature or terminal of boundary ditch.	Loose dark brown sandy clay. Frequent inclusions of sizeable stones.	N/A	C1	C6
5	N/A	2.63	2.4	0.42	Probable drainage feature or terminal of boundary ditch.	Linear cut in plan running NE-SW. Definite corners to SE and SW. Base slopes down to S.	N/A	C6	C2
6	C5	1.97	1.9	0.22	Fill of probable drainage ditch.	Firm loose brown/grey sandy clay. Charcoal flecks. Medium-large stone inclusions.	N/A	C4	C5
7	N/A	1.05m	1.43m	0.5m	Bottom fill of tree bole, burnt mound material	Compact greyish/black stony material	N/A		
8	N/A	N/A	N/A	N/A	Tree bole	Irregular sub-oval cut	N/A		
9	N/A	1m	1.5m	0.24m	Silty top fill of tree bole	Moderately firm dark grey silty clay with occasional small stone inclusions	N/A		
10	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
11	16	1.1m	0.5	0.1	Bottom fill of cut 16	Soft black silt. Charcoal inclusions	N/A	C3	C16
12	C25	Unknown	0.43	0.04	Fill of a furrow.	Firm greyish-brown sandy clay. Pebbly inclusions	N/A	C1	C25
13	N/A	over 3	0.6	0.08	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Irregular flat base.	N/A	C14	C2
14	C13	over 3	0.6	0.08	Fill of a furrow.	Moderate firm greyish-brown silty-sand. Occasional small stone inclusions.	N/A	C1	C13
15	N/A	12	0.6	0.08	Created by burnt spread wash down.	Firm dark-grey sandy silt. Occasional charcoal flecks. Small stones inclusions.	N/A	C1	C2
16	N/A	1.1	0.5	0.1	Cut of a linear feature.	Linear cut in plan running E-W. Gradual break of slope at top. Gradual sides. Imperceptible break of slope at base. Concave linear base.	N/A	C11	C2

Context	Fill of	L(m)	W(m)	D(m)	Interpretation	Description	Finds	Context Above	Context Below
17	C18	2.4	0.4	0.1	Fill of a furrow.	Firm grey silty-sand. Occasional small stone inclusions. Charcoal flecks.	N/A	C1	C18
18	N/A	2.4	0.4	0.1	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Irregular flat base.	N/A	C17	C2
19	N/A	5	0.5	0.12	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Irregular flat base.	N/A	C20	C2
20	C19	5	0.5	0.12	Fill of a furrow.	Firm greyish-brown sandy clay. Pebbly inclusions	N/A	C1	C19
21	N/A	4.4	0.55	0.1	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Concave linear base.	N/A	C22	C2
22	C21	4.4	0.55	0.1	Fill of a furrow.	Firm grey silty-sand. Occasional small stone inclusions. Charcoal flecks.	N/A	C1	C21
23	N/A	3.1	0.34	0.1	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Irregular flat base.	N/A	C24	C2
24	C23	3.1	0.34	0.1	Fill of a furrow.	Firm grey silty-sand. Occasional small stone inclusions. Charcoal flecks.	N/A	C1	C23
25	N/A	Unknown	0.43	0.04	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Gradual sides. Gradual break of slope at base. Flat base.	N/A	C12	C2
26	N/A	Unknown	1.05	0.17	Cut of a furrow.	Linear cut running N-S. Gradual break of slope at top. Moderate sides. Gradual break of slope at base. Concave base.	N/A	C27	C2
27	C26	Unknown	1.05	0.17	Fill of a furrow.	Firm grey sandy clay. 10% pebbly inclusions.	N/A	C1	C26

Appendix 1.2 Catalogue of Artefacts

There were no artefacts from the excavations at Rathwilladoon 4.

Appendix 1.3 Catalogue of Ecofacts


These results relate to the processed samples taken at the excavation. A full list of these samples was supplied with the preliminary reports lodged with Galway NRDO. A total of four bulk soil samples were taken during the course of excavation at this site. All of these were processed by means of flotation and sieving through a 250/300µm mesh. The resulting retrieved samples of this process are listed below.

1.3.1 Charcoal

Charcoal was recovered from four samples following flotation.

Context number	Sample number	Feature	Sample weight (g)
C3	1	Spread	2.9g
C3	1 2	Spread	2.1g
C6	4	Modern ditch	0.3g
C6	4	Modern ditch	21.7g

Appendix 1.4 Archive Checklist

Project:	N18	Irish Archaeological Consultancy Ltd	
Site Name:	Rathwilladoon 4		
NMS Number:	E3655		
Site director:	Ed Lyne		
Date:	03 March 2008		
Field Records		Items (quantity)	Comments
Site drawings (plans)		3	
Site sections, profiles, elevations		6	
Other plans, sketches, etc.		0	
Timber drawings		0	
Stone structural drawings		0	
Site diary/note books		1	
Site registers (folders)		1	
Survey/levels data (origin information)		On plans and disc	
Context sheets		27	
Wood Sheets		0	
Skeleton Sheets		0	
Worked stone sheets		0	
Digital photographs		52	
Photographs (print)		0	
Photographs (slide)		0	
Finds and Environ. Archive			
Flint/chert		0	
Stone artefacts		0	
Pottery (specify periods/typology)		0	
Ceramic Building Material (specify types eg daub, tile)		0	
Metal artefacts (specify types - bronze, iron)		0	
Glass		0	
Other find types or special finds (specify)		0	
Human bone (specify type eg cremated, skeleton, disarticulated)		0	
Animal bone		0	
Metallurgical waste		0	
Enviro bulk soil (specify no. of samples)		4	
Enviro monolith (specify number of samples and number of tins per sample)		0	
Security copy of archive		Yes	IAC Digital

APPENDIX 2 SPECIALIST REPORTS

Appendix 2.1 Radiocarbon Dating Results – QUB Laboratory

Appendix 2.2 Charcoal and Plant Remains – Sarah Cobain

Appendix 2.3 Petrological Analysis – Stephen Mandal

RADIOCARBON DATING RESULTS
RATHWILLADOON 4, CO. GALWAY, E3655

CHRONO LABORATORY, QUEENS UNIVERSITY BELFAST

Colette Rynhart
 Irish Archaeological
 Consultancy Ltd
 120b Greenpark Road
 Bray
 Co. Wicklow, Ireland
 Rep. of Ireland
 VAT No. IE8288812U



¹⁴CHRONO Centre
 Queens University
 Belfast
 42 Fitzwilliam Street
 Belfast BT9 6AX
 Northern Ireland

Radiocarbon Date Certificate

Laboratory Identification: UBA-12737
 Date of Measurement: 2009-10-19
 Site: E3655 Rathwilladoon 4
 Sample ID: C3S1
 Material Dated: charcoal
 Pretreatment: AAA
 Submitted by: IAC

¹⁴C Date: 3231±22
 AMS δ¹³C: -29.6

Information about radiocarbon calibration

RADIOCARBON CALIBRATION PROGRAM*
 CALIB REV5.0.2
 Copyright 1986-2005 M Stuiver and PJ Reimer
 *To be used in conjunction with:
 Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.
 Annotated results (text) - -
 Export file - c14res.csv

C3S1
 UBA-12737
 Radiocarbon Age BP 3231 +/- 22
 Calibration data set: intcal04.14c # Reimer et al. 2004

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal BC 1520- 1491	0.604
	1479- 1457	0.396
95.4 (2 sigma)	cal BC 1601- 1592	0.017
	1532- 1436	0.983

References for calibration datasets:
 PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell, CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich, TP Guilderson, KA Hughen, B Kromer, FG McCormac, S Manning, C Bronk Ramsey, RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor, J van der Plicht, and CE Weyhenmeyer (2004), Radiocarbon 46:1029-1058.

Comments:
 * This standard deviation (error) includes a lab error multiplier.
 ** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
 ** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2)
 where ^2 = quantity squared.
 [] = calibrated range impinges on end of calibration data set
 0* represents a "negative" age BP
 1955* or 1960* denote influence of nuclear testing C-14

NOTE: Cal ages and ranges are rounded to the nearest year which may be too precise in many instances. Users are advised to round results to the nearest 10 yr for samples with standard deviation in the radiocarbon age greater than 50 yr.

THE CHARCOAL AND PLANT REMAINS
RATHWILLADOON 4, CO. GALWAY, E3655
SARAH COBAIN

*De Faoite Archaeology,
Unit 10 Riverside Business Centre,
Tinahely, Co Wicklow*

Introduction

The survival of seed and charcoal macrofossils from dry land archaeology sites is dependent upon the water table being high enough to keep the archaeological features in damp/wet and anoxic conditions. This does not usually occur on archaeological sites in Ireland, unless they are located on riverine flood plains or close to lakes. Seeds and charcoal are however preserved abundantly in the form of charcoal and carbonised plant remains as a result of burning activities in features such as hearths, kilns, furnaces, burnt structures and as waste material disposed in ditches and pits.

There were 24 burnt mound sites spanning from the early to late Bronze Age period in date on the N18 Gort to Crusheen road scheme. The burnt mound activity from Caheraphuca 5, 8, 9, 10, 11, Ballyline 3, Drumminacloghaun, Clooneen and Gortavoher dated from the early Bronze Age. Ballyline 1 and 2, Gortaficka 1 and 2 and Rathwilladoon 4 were from the early to mid Bronze Age and Sranagalloon 1, 3 Caheraphuca 1, 3, 4, 6, 7, 12, Monreagh, Monreagh 3 and Derrygarriff 3 were dated to the mid to late Bronze Age. These sites consisted of archaeological features associated with burnt mound activity and included burnt mounds, spread, troughs, pits and gullies. Plant macrofossil and charcoal remains provide valuable information to determine socio-economic activity on archaeology sites. It is the aim of this report to identify the seed and charcoal species recovered from all these sites and to use this information to:

- 1) provide additional information regarding the function of features sampled
- 2) interpret the diet and living conditions of the occupants of the site
- 3) interpret socio-economic and industrial activities on the site
- 4) infer the composition of the local flora and woodland.

Methodology

There were 2 samples to be analysed for charcoal remains and 1 for plant macrofossil remains. The following methodology was used to identify the plant macrofossil and charcoal fragments.

Charcoal

The number of charcoal fragments to be identified is dependent on the diversity of the flora. A study by Keepax (1988:120–124) has indicated that depending on the location of the archaeology site, 100–400 fragments of charcoal would need to be identified in order to obtain a full range of species diversity. As Britain and Ireland have a narrow flora diversity in comparison to that of mainland Europe, an identification limit of 100 fragments has been deemed sufficient for samples from either of these two countries (Keepax 1988; cited in Austin 2005:1). As the majority of the samples contained more than 100 fragments, in accordance with Keepax (1988), a maximum of 100 fragments were identified. Of the samples which contained greater than 100 fragments these were sieved through a 10 mm, 4 mm and 2 mm sieve and an equal proportion of each sieve were identified. This is to prevent any bias that may occur if only larger pieces are identified (thereby ensuring any potential smaller species are equally represented).

Each charcoal fragment was fractured by hand to reveal the wood anatomy on radial, tangential and transverse planes. The pieces were then supported in a sand bath and identified under an epi-illuminating microscope (Brunel SP400) at magnifications from x40 to x400. The sand bath allowed the charcoal pieces to be manipulated into the flattest possible position to aid identification. As fragments less than 2 mm in size cannot be accurately identified (it is not possible to get a wide enough field of vision to encompass the necessary anatomical features for identification) only fragments

above this size were examined. During identification, any notable growth-ring characteristics, evidence of thermal and biological degradation and any other unusual microscopic features were recorded. Identifications were carried out with reference to images and descriptions by Cutler and Gale (2000) and Heller et al. (2004) and Wheeler et al. (1989). Nomenclature of species follows Stace (1997).

Plant macrofossils

Plant macrofossil remains were retrieved by standard flotation procedures by IAC Ltd using 1 mm and 250 micron sieves. The floated material was sorted and seeds identified using a low-power stereo-microscope (Brunel MX1) at magnifications of x4 to x40. Identifications were made with reference to Cappers et al. (2006), Berggren (1981) and Anderberg (1994). Nomenclature follows Stace (1997).

Results

The plant macrofossil and charcoal results are fully tabulated in Table 9 in the Appendix at the end of the report.

Charcoal identification notes

The anatomical similarities between (a) the Maloideae species (hawthorn, rowan, crab apple); (b) alder/hazel; (c) sessile/pedunculate oak; (d) wild/bird cherry and (e) poplar/willow mean that it was not possible to identify these taxa to species level (Cutler and Gale 2000).

E3653 Caheraphuca 1

There were five samples retrieved from Caheraphuca 1. Sample 15 (C29) was recovered from pit C100, C101 and contained hazel, oak, ash, cf hawthorn, and poplar/willow charcoal inclusions. The fill (C58-sample 18) of pit/trough, C57 contained alder/hazel and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Burnt spread material C95 (sample 30) contained alder/hazel, birch, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions. Two samples were retrieved from pit C102. Secondary fill C106 (sample 39) contained alder/hazel charcoal fragments and tertiary fill C107 (sample 35) contained alder/hazel, oak, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and elm charcoal inclusions.

E3653 Caheraphuca 3

Five samples were analysed from Caheraphuca 3. Burnt spread C327 contained no charcoal inclusions and pit/tree hole pit C332 (sample 21-C333, samples 20 and 32--C334 and sample 38 C344) contained hazel, alder/hazel oak and ash charcoal inclusions. Sample 20 (fill C334) also contained a single carbonised hazelnut shell.

E3653 Caheraphuca 4

Burnt spreads C404 and C405 were retrieved as samples 2 and 3, respectively. C405 contained hazel, alder/hazel, oak, ash, cf hawthorn, blackthorn/sloe, poplar/willow and elm charcoal inclusions. Burnt spread C405 contained alder, hazel, alder/hazel, birch, oak, ash, cf hawthorn, cf crab apple and blackthorn/sloe charcoal inclusions.

E3653 Caheraphuca 5

A single sample (sample 1) was retrieved from the burnt spread C504 at Caheraphuca 5. This sample contained hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and yew charcoal inclusions.

E3653 Caheraphuca 6

Three samples were retrieved from burnt mound material at Caheraphuca 6. Deposit C604 (sample 3) contained alder and hazel charcoal inclusions, deposit C605 (sample 1) contained alder/hazel, oak, cf hawthorn, blackthorn/sloe and elm charcoal fragments and deposit C608 (sample 12) contained hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal inclusions. Sample 7 was retrieved from fill C617, which was a packing fill supporting timber C612. This fill contained alder, hazel, oak and ash charcoal inclusions.

E3653 Caheraphuca 7

Samples 2 and 7 were retrieved from burnt spread deposits C708 and C709 (respectively). Sample 2 (C708) contained hazel, alder/hazel, birch, oak, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments. Deposit C709 contained alder/hazel, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions. Trough C715 contained fill C713 (sample 8), which contained alder/hazel, birch, oak and ash charcoal inclusions. Sample 5 was retrieved from the fill (C710) of pit C711. This pit contained alder/hazel, oak, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry and blackthorn/sloe charcoal inclusions. Pit C712 contained fill C704 (sample 3), which included alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry and blackthorn/sloe charcoal inclusions.

E3653 Caheraphuca 8

Five samples were analysed from burnt mound activity at Caheraphuca 8. Sample 10, 39, 48 and 54 were retrieved from burnt mound spreads C810, C827, C829 and C835 respectively. Sample 10 (C810) contained alder and oak charcoal inclusions and a single carbonised hazelnut shell fragment. Burnt mound spread C827 (sample 48) included alder/hazel and ash charcoal fragments. Alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn and poplar/willow were recovered from burnt mound spread C829 (sample 54). Sample 88 (C835) contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn, cf crab apple and yew charcoal fragments. One additional sample (sample 39) was retrieved as a packing fill (C825) located under timber plank C814. This packing fill (C825) contained hazel, alder/hazel, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

E3653 Caheraphuca 9

Sample 2 was retrieved from the fill (C906) of pit C904 and contained alder and ash charcoal inclusions.

E3653 Caheraphuca 10

Two samples were retrieved from burnt mound activity at Caheraphuca 10. Burnt mound spread C1008 was retrieved as sample 4 and contained alder/hazel and oak charcoal fragments. The spread of unburnt stones C1005 (sample 1) contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

E3653 Caheraphuca 11

Trough C1109 contained the fill C1118 (sample 5) which included alder/hazel, oak and elm charcoal fragments.

E3653 Caheraphuca 12

Two samples were retrieved from Caheraphuca 12. Sample 1 was taken from burnt mound spread C1203 and contained alder, hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry, yew and elm charcoal fragments.

Sample 2 was retrieved from the fill (C1204) of trough C1204. This fill contained elder, alder, hazel, alder/hazel, oak, ash and wild/bird cherry charcoal inclusions.

E3655 Rathwilladoon 4

The burnt mound spread (C3 – sample 1) at Rathwilladoon 4 contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and elm charcoal inclusions and a single carbonised hazelnut shell inclusion. The fill (C6) of boundary ditch, C5 contained hazel, alder/hazel, oak and ash charcoal inclusions.

E3712 Monreagh 1 and 2

Four samples were retrieved from Monreagh 1 and 2. Sample 13 was recovered from the fill (C25) of trough C24 and contained alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), blackthorn/sloe and yew charcoal fragments. Fill C36 (sample 18) from trough C35 contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 21 was retrieved from fill C41 within pit C40. This fill contained ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions. Sample 14 was retrieved from fill C27 within well C26. This sample contained elder, hazel, oak, cf hawthorn and wild/bird cherry.

E3713 Sranagalloon 1

Sample 2 was retrieved from burnt mound spread C5 and contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and elm charcoal inclusions. Trough C8 contained fills C11, C12, C9 which were retrieved as sample 22. This sample contained hazel, alder/hazel, birch, oak, ash, traveller's joy and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments.

E3715 Ballyline 3

Sample 1 (C4) was retrieved from pit C3. This pit contained hazel, alder/hazel, birch, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. The sample (sample 2) retrieved from burnt mound material, C5, contained hazel, alder/hazel, oak, ash, cf hawthorn and elm charcoal inclusions.

E3716 Derrygarriff 3

Three samples were retrieved from burnt mound activity at Derrygarriff 3. Sample 8 was recovered from burnt mound material (C3) and contained alder/hazel, ash, Maloideae species (hawthorn/rowan/crab apple), cf hawthorn and poplar/willow charcoal fragments. Hazel, alder/hazel, birch, ash, Maloideae species (hawthorn/rowan/crab apple), wild/bird cherry, poplar/willow and elm charcoal inclusions were obtained from fill C5 (sample 1) within trough C4. Sample 6 was retrieved from the fill (C8) of trough C6 and contained alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and wild/bird cherry charcoal fragments.

E3717 Ballyline 1 and 2

Troughs C22 and C6 were analysed for charcoal remains from burnt mound activity at Ballyline 1 and 2. The fill (C25-sample 1) of trough C22 contained alder/hazel, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 9 was recovered from fill C7 within trough C6. This fill contained alder, hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and poplar/willow charcoal inclusions.

E3720 Drumminacloghaun 1

Burnt spread material C3 (sample 2) from Drumminacloghaun 1 contained alder/hazel, oak, ash, yew and elm charcoal fragments and a single carbonised

yellow water lily seed. The fill (C6-sample 5) from trough C4 only contained three ash charcoal fragments.

E3722 Clooneen 1

There were three samples retrieved from burnt mound activity at Clooneen 1. Sample 6 was recovered from burnt spread material C3 and contained alder, hazel, alder/hazel, ash and poplar/willow charcoal inclusions. A packing fill layer (C15 – sample 10) which was located under the wooden base of trough C8 contained alder and ash charcoal inclusions. The fill C7 (sample 3) from pit C7 contained alder, hazel, alder/hazel and ash charcoal inclusions.

E3897 Sranagalloon 3

There were eight samples recovered from burnt mound activity at Sranagalloon 3. The spread (C34-sample 40) from possible up cast material contained birch, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions. Burnt spread material C3 (sample 38) contained hazel, alder/hazel, cf hawthorn, cf crab apple, blackthorn/sloe and elm charcoal inclusions. Two fills (C30 and C35 –samples 28 and 27 respectively) were recovered from trough C28. Fill C30 contained alder, hazel, alder/hazel, cf hawthorn, cf crab apple, blackthorn/sloe and elm charcoal inclusions and a single carbonised hazelnut shell. Fill C35 contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple) and poplar/willow charcoal fragments and a single carbonised hazelnut shell. Trough C50 contained fill C8 (sample 41). This fill included alder, hazel, alder/hazel, ash and cf hawthorn charcoal fragments. Two fills were sampled from pit C19. Sample 10 was taken from fill C22 and contained hazel, ash, wild/bird cherry and poplar/willow charcoal inclusions. Sample 12 (C27) contained alder/hazel and poplar/willow charcoal fragments.

E3898 Gortaficka 1 and 2

A single sample (sample 1) was recovered from burnt spread material C3 at Gortaficka 1. This sample contained hazel, alder/hazel, ash and wild/bird cherry charcoal inclusions. Two samples were taken from burnt mound material at Gortaficka 2. Sample 5 was retrieved from deposit C10 and contained alder, hazel, alder/hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow and yew charcoal inclusions. Deposit C20 (sample 8) contained hazel, alder/hazel, oak, ash and yew charcoal fragments. Fill C41 (sample 35) from within trough C39 and contained wayfaring tree, alder/hazel, traveller's joy and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments. Sample 20 was retrieved from fill 29 within pit C21. This sample contained hazel, alder/hazel, oak, ash, Maloideae species (hawthorn/rowan/crab apple), poplar/willow, yew and elm charcoal inclusions. Drainage gully C53 contained fill C55. The sample from this fill (sample 37) contained two fragments of wayfaring tree charcoal.

E3984 Gortavoher 1

There were two samples recovered from burnt mound material deposits from Gortavoher 1. Sample 1 was recovered from deposit C3 and contained wayfaring tree, hazel, birch, oak, ash, Maloideae species (hawthorn/rowan/crab apple), cf crab apple, blackthorn/sloe, poplar/willow, yew and elm charcoal fragments and carbonised mustard/cabbage, tufted vetch and water pepper seeds. Deposit C6 (sample 2) contained hazel, alder/hazel, birch, oak, Maloideae species (hawthorn/rowan/crab apple), poplar/willow, yew and elm charcoal inclusions.

E4037 Monreagh 3

Three samples were retrieved from burnt mound activity at Monreagh 3. Sample 2 was recovered from burnt mound material C3 and contained alder, hazel,

alder/hazel, oak, ash and elm charcoal inclusions and two carbonised hazelnut shell inclusions. The fill C11 (sample 3) from trough C10 contained alder/hazel, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal fragments and uncharred blackberry and stone bramble seeds. The fill from pit C8 contained alder/hazel, birch, oak, ash and Maloideae species (hawthorn/rowan/crab apple) charcoal inclusions.

Discussion

Burnt mound/spreads

Table 1: Burnt mounds, spreads and deposits excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Burnt spread material	C95
E3653 Caheraphuca 3 *	Burnt spread material	C327
E3653 Caheraphuca 4	Burnt mound material	C404, C405
E3653 Caheraphuca 5	Burnt spread material	C504
E3653 Caheraphuca 6	Burnt mound material	C604, C605, C608
E3653 Caheraphuca 7	Burnt deposit	C708, C709
E3653 Caheraphuca 8*	Burnt spread	C810
E3653 Caheraphuca 8	Shallow burnt spread	C827, C835
E3653 Caheraphuca 8	Burnt spread material	C829
E3653 Caheraphuca 10	Burnt mound material	C1008
E3653 Caheraphuca 10	Spread of unburnt stones	C1005
E3653 Caheraphuca 12	Burnt mound material	C1203
E3655 Rathwilladoon 4*	Burnt mound material	C3
E3713 Sranagalloon 1	Burnt spread material	C5
E3715 Ballyline 3	Burnt spread material	C5
E3716 Derrygarraff 3	Burnt spread material	C3
E3720 Drumminacloghaun 1 *	Burnt spread material	C3
E3722 Clooneen 1	Burnt mound material	C3
E3897 Sranagalloon 3	Spread – up cast from trough	C34
E3897 Sranagalloon 3	Burnt spread material	C3=C12
E3898 Gortaficka 1	Burnt spread material	C3
E3898 Gortaficka 2	Burnt mound material	C10, C20
E3984 Gortavoher 1 *	Burnt mound material	C3, C6
E4037 Monreagh 3 *	Burnt mound material	C3

* - also contained plant macrofossils

Table 1 shows context numbers of the burnt mound deposits/burnt spreads from each site sampled on the N18. This activity involved heating stones on a hearth and then placing these into troughs filled with water, thereby heating or boiling the water. The stones were then raked out of the trough and ultimately piled as waste material into a horseshoe-shaped mound around the working area. The mounds usually contain burnt stones along with frequent charcoal inclusions which represent the remains of the firing debris used within the hearth/s to heat the stones. All of the burnt spreads/mounds along the N18 route (with the exception of C317 Caheraphuca 3) contained moderate to frequent charcoal inclusions which would represent the firing debris from fuel used within the hearths. The burnt spread samples from Caheraphuca 3 (C327), Caheraphuca 8 (C810), Rathwilladoon 4 (C3), Gortavoher 1 (C3) and Monreagh 3 (C3) also contained carbonised hazelnut shells which may

represent either remains of food consumed during burnt mound activities or hazelnuts still attached to the hazel branches which used as fuel.

The spread of unburnt stones (C1005) at Caheraphuca 10 and spread of uncast material (C34) at Sranagalloon 3 both contained only occasional charcoal inclusions as a result no further information about the use/function of these two spreads can be deduced from palaeoenvironmental activity.

Troughs

Table 2: Troughs excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Fill of pit/trough C57	C58
E3653 Caheraphuca 6	Fill of trough – fill supporting timber C612	C617
E3653 Caheraphuca 7	Fill of trough, C715	C713
E3653 Caheraphuca 11	Top fill of waste pit/trough, C1109	C1118
E3653 Caheraphuca 12	Fill of trough C1205	C1204
E3712 Monreagh 1 and 2	Fill of trough C24	C25
E3712 Monreagh 1 and 2	Fill of trough C35	C36
E3713 Sranagalloon 1	Fill of trough, C8	C9, C11, C12
E3716 Derrygarriff 3	Fill of trough C4	C5
E3716 Derrygarriff 3	Fill of trough, C6	C8
E3717 Ballyline 1 and 2	Fill of trough, C22	C25
E3717 Ballyline 1 and 2	Fill of trough, C6	C7
E3720 Drumminacloghaun 1	Fill of trough, C4	C6
E3722 Clooneen 1	Layer under wooden base of trough, C8	C15
E3897 Sranagalloon 3 *	Fill of trough C28	C30, C35
E3897 Sranagalloon 3	Fill of trough, C50	C8
E3898 Gortaficka 2	Fill of trough, C39	C41
E4037 Monreagh 3 *	Fill of trough C10	C11

* - also contained plant macrofossils

The troughs outlined in Table 2 from Sranagalloon 1, Caheraphuca 1, 7, 11, 12, Monreagh, 1 and 2, Derrygarriff 3, Ballyline 1 and 2 and Drumminacloghaun 1 all contained a mixture of silty material, burnt stones and charcoal indicating that they were backfilled with burnt mound material soon after use, either deliberately or through collapse or animal treading whereas the troughs from Sranagalloon 3 Gortaficka 2 and Monreagh 3 contained less charcoal and burnt stones which suggests they silted in naturally. Fill C15 was located under the wooden base of trough C8 at Clooneen 1 and C617 was located under timber plank C612 at Caheraphuca 6. These fills have been interpreted as deliberately placed packing fills for their respective trough structures. The charcoal within these fills is most likely intrusive and was derived from the charcoal/stones being deposited into the trough above.

The hazelnut shells recovered from fills C30 and C35 within trough C28 at Sranagalloon 3 were most likely deposited through disposal of hazelnut shells into the fire after consumption on the site, or through hazelnuts attached to branches used as fuel in the fires. The blackberry and stone bramble seeds were uncharred

and most likely silted into or deposited by birds/ small mammals into trough C10 at Monreagh after it went out of use.

Pits

Table 3: Pits excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3653 Caheraphuca 1	Fill of pits C100 and C101	C29
E3653 Caheraphuca 1	Secondary (C106) and tertiary (C107) fill of pit C102	C106 and C107
E3653 Caheraphuca 3	Fills of pit/tree root C332	C333, C334, C344
E3653 Caheraphuca 7	Fills of pits C711 and C712	C710 and C704
E3653 Caheraphuca 9	Secondary fill of pit C904	C906
E3712 Monreagh 1 and 2	Fill of pit, C40	C41
E3715 Ballyline 3	Fill of pit, C3	C4
E3722 Clooneen 1	Fill of pit C12	C7
E3897 Sranagalloon 3	Fill of pit, C19	C22, C27
E3898 Gortaficka 2	Fill of pit, C21	C22, C29
E4037 Monreagh 3	Fill of pit	C8

The pits at Caheraphuca 1 (pit C29), Ballyline 3, Clooneen 1, Caheraphuca 3 Caheraphuca 7 Caheraphuca 9, Monreagh 3 and Monreagh 1 and 2 as outlined in Table 3 were all deliberately backfilled with burnt mound material and contained frequent charcoal inclusions. This charcoal can be attributed to residual firing debris from hearths used to heat stones. The pits at Sranagalloon 3, Gortaficka 2, Caheraphuca 1 (C102) and Caheraphuca 3 silted up naturally and the charcoal within these features was most likely residual from firing debris.

Well

Table 4: Well excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3712 Monreagh 1 and 2	Fill of a well C26	C27

The fill (C27) from well C26 at Monreagh sites 1 and 2 contained frequent charcoal inclusions. There was no burning *in situ* recorded around the edges of this cut and this, together with the burnt stone inclusions, indicates that the well was deliberately backfilled after its final use with charcoal-rich burnt mound material.

Linear features

Table 5: Linear feature excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal)

Site Name	Details	Context Number
E3898 Gortaficka 2	Fill of drainage gully C53	C55

The fill (C55) from drainage gully C53 at Gortaficka 2 contained only two fragments of charcoal. It is most likely this residual charcoal accumulated from nearby through natural silting into the drainage gully after the gully went out of use.

Platform/Timber features

Table 6: Timber features excavated on the N18 road scheme (exclusively those analysed for plant macrofossils and charcoal).

Site Name	Details	Context Number
E3653 Caheraphuca 8	Burnt material under timber plank, C814	C825

The fill (C825) from under timber plank C814 at Caheraphuca 8 contained only occasional fragments of charcoal. It is most likely this residual charcoal accumulated from nearby burnt mound activity and silted under the timber plank during the use of the structure.

Economic and Industrial Activities

Burnt Mound Activity

The plant macrofossil evidence from the samples recovered from burnt mound activity from sites Gortavoher 1, Monreagh 3, Sranagalloon 1, 3, Rathwilladoon 4, Caheraphuca 3, 8, 12 not provide any definitive explanation for the use of these features. The hazelnut shells recovered are indicative of a food source being consumed, perhaps as a snack during burnt mound use or they could have been attached to hazel branches which were subsequently burnt. The vetch, mustard/pepper, yellow water lily, blackberry and water pepper can all be consumed (discussed below), although they were recovered in very small quantities from these sites suggesting they were accidental inclusions (accidental losses during harvesting, the burning of weeds or they were dropped by animals/birds) rather than an indication of food production.

Fuel use

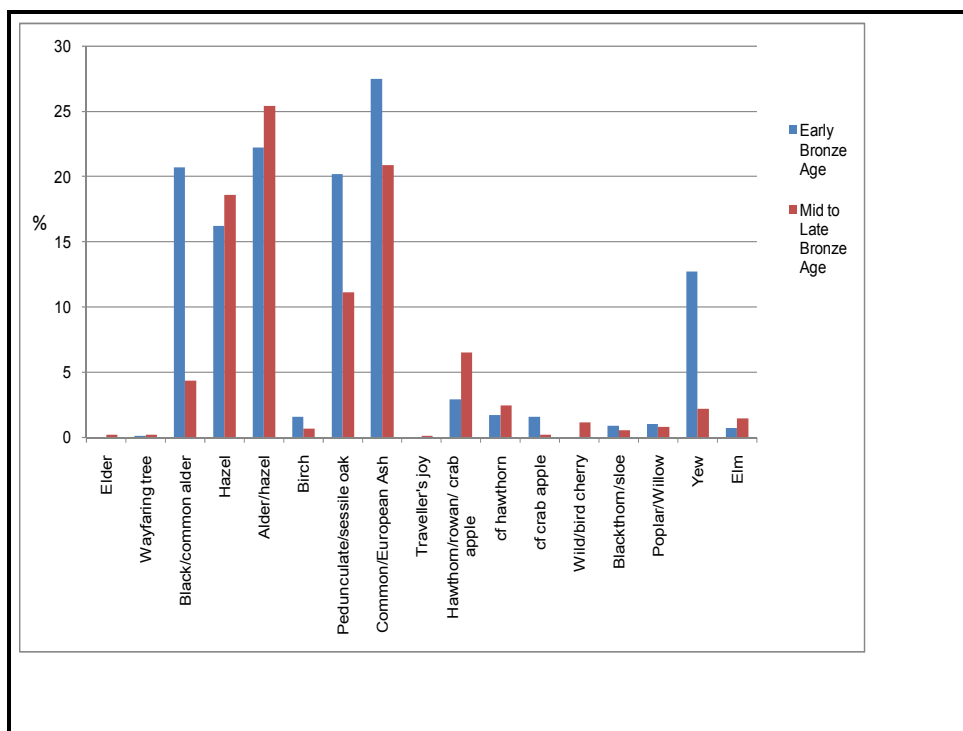
The woodland species exploited for fuel for burnt mound activities was similar throughout the Bronze Age period. The main fuels used as firing material for burnt mound activity on the N18 were ash, oak and elm. There was a high proportion of oak, ash and elm charcoal fragments which did not show obvious curved growth rings: therefore it is likely the wood was derived from larger branches or stem (trunk) wood which would have been deliberately cut with the intention of burning (rather than opportunistic gathering of brushwood). There was also a proportion of the oak and ash charcoal which did exhibit curved growth rings, which is likely to represent smaller branches. Ash, oak and elm would have been chosen as they have dense heartwood and with good ventilation, and burn slowly, maintaining an even temperature (Cutler and Gale, 2000:120, 205, Stuijts, 2005:145). This is essential for a fire being used to heat up stones as it would require constant heat for relatively long periods of time; and as collection of wood is a labour intensive activity, selection of species according to their burning properties would have been commonplace. There was also a high percentage of hazel and alder/hazel charcoal from all the N18 sites. Hazel is recorded as a reasonable fuel wood and was widely available within oak woodlands, particularly on the fringes of cleared areas (Grogan et al. 2007:30). It is possible that the hazel was used as a dominant fuel wood where oak and ash was not available.

The remaining charcoal recorded from the N18 sites consisted of elder, wayfaring tree, alder, hazel, birch, traveller's joy, hawthorn, rowan, crab apple, wild/bird cherry, blackthorn/sloe, poplar/willow and yew. The majority of the charcoal from these species exhibited curved growth rings, which suggests they derived from round wood lateral branches rather than stem/trunk wood. It is therefore likely that these branches were collected as deadwood and used within brushwood bundles as kindling for the fire. Alder, elder, birch, poplar/willow are species that are ideal to use for kindling. They are all anatomically less dense than for example, oak and ash, and burn quickly at relatively high temperatures (Cutler and Gale, 2000:34, 50, 236, Grogan et al. 2007:29, 31). This property makes them good to use as kindling, as the high temperatures produced would encourage the oak and ash to ignite and start to burn.

The hawthorn, rowan, crab apple, yew, wild/bird cherry, blackthorn/sloe have a closer grain anatomical structure, and as a result make reasonable firewood (Grogan et al. 2007:30-31; Cutler and Gale, 2000:196; Stuijts, 2005:144); however, the majority of charcoal from these species originated from small twigs which indicates that rather than being the dominant fuels, these were kindling used to ignite the oak, ash and elm. Wild/bird cherry and blackthorn/sloe can be slow to ignite and burn therefore they need assistance from other species such as alder or birch which burn at high temperatures in order to continue to burn. Travellers joy and wayfaring tree have both been recorded as good fuel woods, however as these species are both small shrub species, and because of their small representation within the charcoal assemblage, it is most likely they were collected inadvertently while gathering other twigs/roundwood for brushwood bundles (Stuijts, 2005:145, Cutler and Gale, 2000:80).

There were several slight percentage changes in species used in the early compared to mid to late Bronze Age as indicated by Figure 1. While these trends have been observed, they must be interpreted with caution because the percentage fragment count cannot be used to deduce the actual abundance of these species within the woodland (see composition of local woodlands section below for a more detailed discussion). Therefore the percentages outlined below can only realistically be used to indicate a 'presence'/'absence' variable for each species within the environment.

Figure 1: Percentage change (fragment count) in species used as fuel in the early to late Bronze Age period.



The most noticeable percentage change was the decrease in the presence of oak and ash from the early to late Bronze Age period. This can be attributed to the increase in deforestation throughout the Bronze Age period to make way for settlement, agriculture and industrial activities, which resulted in oak and ash becoming less widely available. This trend is mirrored in the pollen core results obtained from Sheeauns Lough in Connemara. Research by Molloy and O’Connell (1991:79) demonstrated a similar trend with a decrease in oak and ash pollen occurring during the late Bronze Age period. The other large percentage change to occur was the drop in yew between the early and late Bronze Age period. Yew was one of the dominant trees along with oak during the late Neolithic period; however the increase in forest clearance led to a sharp decrease in its presence within oak woodlands. This is again observed in Molloy and O’Connell’s (1991:102) research which shows an increase in yew tree pollen until the early Bronze Age, when its abundance starts to decrease. In tandem with the N18 Gort to Crusheen scheme an environmental study has been carried out in the vicinity of the burnt mound sites at Caheraphuca townland. Unfortunately the analysis was not complete by the time that the final excavation reports were compiled.

Management of the local environment

Fuel wood has been a valuable commodity throughout history and has been systematically cleared for settlement, agricultural and industrial activities from the Neolithic period onwards. There are at least 7000 known examples of burnt mounds in Ireland (Power et al. 1997 cited in Grogan et al. 2007, 81) which indicates that their use was widespread throughout the Bronze Age period and subsequently this would have had a huge impact on woodland. Bronze Age communities would have been aware of the impact of deforestation, and coppicing would have been introduced to

manage and retain this valuable resource. The high volume of hazel and alder roundwood within the charcoal is indicative of woodland management by coppicing. This type of woodland management would have been undertaken by cutting the tree to a stump every five to seven years and allowing it to re-generate. The new stems produced were harvested and used for fuel and construction of other wooden structures. This management ensured that the woodland resource was maintained for future generations (Van der Verf 1991, 97; Rackham 1980, 103).

Herbaceous taxa and diet

Herbaceous plants were often exploited to be used as herbs in cooking, vegetables or eaten raw in salads, all of which would have helped add flavour to food and to provide vitamins, minerals and additional fibre. Cabbage/mustard has been recorded as being eaten raw as salad, boiled down and used as pottage in stews and soups and as a vegetable similar to spinach (Behre 2008:67-8). Vetches were also retrieved on the site and are recorded to have been used to thicken stews. Water pepper is also present. It has a very acrid taste and for this reason, its seeds have been used for spices in food (Timson 1966:817). There is also evidence of fruit seeds and nuts – stone bramble and blackberries. These berries would have provided additional vitamin C and were possibly eaten raw or added into tarts/cakes (Pearson 1997: 14). Hazelnut shells were also recovered from various sites. The consumption of hazelnuts would have provided a valuable source of vitamins and minerals and would be eaten raw or could be crushed and added to stews (Pearson 1997:13).

All these species have been recorded as food through documentary sources, analysis of archaeological ecofacts and also information based on foods we eat today. Macrofossil analysis of the stomach contents of bog bodies from Kayhausen (Oldenburg, Germany), the Grauballe man (Jutland, Denmark), the Tollund man (Jutland, Denmark) and Lindow man (Lindow Moss, Cheshire, Britain) have shown indicated the presence of species such as cabbage/mustard and various fruits and nuts within the stomach contents of these people when they died. As these taxa were all found in Ireland during the prehistoric period, it can be assumed that they would have been selected and consumed (or processed to use in/or with cooking food) in Ireland. Their inclusion within the plant macrofossil record from the N18 may purely be indicative of weed species establishing in disturbed areas of the site, however it cannot be disregarded that some of these species were being exploited and consumed.

Composition of local woodlands and flora

All the archaeological sites within this report were located in areas of wetland, peat or areas prone to flooding as described in Table 7 below.

Table 7: Location of Burnt mound sites on the N18 Gort to Crusheen road scheme.

Site Name/Code	Description of present day ecological setting
E3653 Caheraphuca 1	A hollow between two peat basins
E3653 Caheraphuca 3-12	Located around a peat basin formed on the site of the now drained Caheraphuca Lough
E3655 Rathwilladoon 4	Located on the edge of a wetland area
E3712 Monreagh 1 and 2	Undulating peat covered land
E3713 Sranagalloon 1	Located on an area of flat pasture land, prone to flooding
E3715 Ballyline 3	
E 3716 Derrygarriff 3	Raised ground in a wetland area

E3717 Ballyline 1 and 2	Low lying flat land, close to the base of a hill
E3720 Drumminacloghaun 1	Raised area of pasture land with a natural spring and wetland area to the north
E3722 Clooneen 1	Located in a peat basin on drained bog land
E3897 Sranagalloon 3	Located between pasture and peat covered area along the base of a steeply sloping N-S orientated stream valley
E3898 Gortaficka 1 and 2	Marginal land between a pasture and peat covered area, adjacent to a N-S orientated stream
E3984 Gortavoher 1	Located at the base of a slope, positioned where the slope ended and an area of peat land began, close to the Scarriff stream
E4037 Monreagh 3	Located on the edge of a wetland area.

Local flora - Evidence from plant macrofossils

Submerged water plants

There were no submerged water plants retrieved from the N18 burnt mound sites.

Marsh/fen species

Water-pepper and yellow water lily are both species which grow in marshy, waterlogged areas and were found at Gortavoher 1 and Drumminacloghaun 1 (respectively). Water-pepper may possibly have been hand selected to use in foods (as discussed above), however it is most likely that both these species were transported by birds or other small animals and dropped/disposed of on the site.

Opportunistic/ruderal species

Cabbage/mustard, blackberry, stone bramble are all opportunistic species which grow well on cleared/waste ground. These species all could have grown easily within the N18 burnt mound sites (Gortavoher 1 and Monreagh 3 respectively) taking advantage of drier cleared areas and waste ground around the site and adjacent to tracks leading the site. While these are all considered 'weed' species, it cannot be disregarded that these were also food sources during this time, so their inclusion within the archaeological features could indicate their consumption. However as so few were recovered, it most likely signifies their accidental collection with brushwood fuel or was an indication of local flora growing in and around the site.

Dryland species

Vetch was the only dryland species recovered from the burnt mound sites (Gortavoher 1) (Holland 1919:9-10). As these were recovered in small quantities it is most likely they were either dropped by birds or small animals or were inadvertently collected with brushwood and burnt in the fires.

Local woodlands – Evidence from charcoal remains

As asserted by Scholtz (1986) cited in Prins and Shackleton (1992:632), the "Principle of Least Effort" suggests that communities of the past collected firewood from the closest possible available wooded area. If this theory were to be used it would assume that from the species collected the woodland surrounding the site would consist of oak-ash woodland in dryland areas (usually away from the sites) and alder-carr fen in areas close to the sites. Whilst this can be used as the basic theory, other variables affecting wood collection must be taken into account (Prins and Shackleton 1992:632). These include:

- 1) *Selection of particular species in favour of others within the woodland*

Oak, ash and elm were likely to have been deliberately selected as fuel to use in a hearth/furnace (used to heat stones for burnt mound activity) as they are considered long lasting and effective fuels (Stuijts 2005:141 and 143) so it is likely they were preferentially searched for and harvested and would have a higher percentage representation within the charcoal assemblage.

2) *Deliberately cultivated species*

The evidence of hazel and alder coppicing during the Bronze Age is another variable, which by altering and managing the environment would have increased the amount of available wood therefore its representation within the charcoal assemblages.

3) *Differential preservation of charcoal/non-uniform survival of charcoal over time*

Preservation rate of charcoal can be affected by a number of variables, for example

- Mechanical abrasion on a site with stony subsoil may cause the charcoal fragments to be broken into smaller unidentifiable fragments.
- Two identical pieces of wood may fragment into different numbers of charcoal fragments when burnt. Some, all or none of these may be recovered from the archaeological record which would affect possible woodland reconstructions.
- The overall heat of the fire may cause the wood to turn to ash and not be represented at all in the archaeological record (Asouti and Austin, 2005:1-5).

As a result of these variables it is not possible to infer from the fragment counts obtained the percentages/numbers of each of these species within the local environment. However, based on the assumption that communities will collect wood from the closest possible source (Scholtz 1986) and, in particular, the collection of economically less important kindling fuel wood (which was most likely obtained from the area close to the site), the charcoal assemblage does suggest that the local vegetation throughout the Bronze Age would have consisted of alder-carr fen in the immediate vicinity of the sites due to their wetland location. There was, however, a large assemblage of charcoal from species indicative of dryland areas which indicate the presence of oak-ash woodland on raised areas/slopes close to the sites.

Alder-carr woodland

The evidence of alder-carr fen woodland indicates a damp to waterlogged environment close to the burnt mound sites. This type of woodland would have consisted of alder, willow and poplar are all trees which thrive in waterlogged and damp soils, particularly in areas close to streams or with a high water table (McVean 1953:451, Stuijts 2005:143 and Cutler and Gale 2000:190). Viburnum and elder are both understory shrubby plants/small trees which grow in damp, waterlogged soils again adjacent to streams, lakes and in areas with a high water table (Stuijts 2005:145; Aitkinson and Aitkinson 2002:897). Birch is a tree which can tolerate both dry and damp soils and would most likely be located in marginal areas between the damp, waterlogged soil and drier areas, upslope from the burnt mound sites (Stuijts 2005:140).

Oak-Ash woodland

The large assemblage of dryland wood species indicates the presence of an oak-ash woodland, close to the burnt mound sites. This would have consisted of oak, ash and elm trees which would be the dominant large tree species (Cutler and Gale 2000:120, 205, Stuijts 2005:145). On the marginal areas of oak-ash woodlands or in clearings, yew, rowan, hazel, hawthorn, crab apple, wild/bird cherry and blackthorn all thrive. These species are all lower level woodland species and will grow in shaded conditions, however, they are usually located where there is a higher light availability to allow flowers and fruits to develop (Stuijts 2005:142, 144; Cutler and

Gale 2000:88, 183, 196). Traveller's joy is an understory shrub plant which clings to trees within oak woodlands to grow (Cutler and Gale 2000:80).

Conclusion

The archaeological features excavated from the N18 burnt mound sites have provided a rich assemblage of charcoal which allows an interesting insight into the industrial activities of the Bronze Age community. The charcoal remains identified from all burnt mound features (troughs, burnt mounds, burnt spreads, pits, gullies, wooden structures) represented firing debris from the fuel used in hearths to heat stones. These stones would then have been used either to heat/boil water within troughs on site.

The fuel used to heat the stones appears to have been exploited from alder-carr fen woodland consisting of alder, willow, poplar, viburnum and birch, and oak-ash woodland consisting of oak, ash, elm, hazel, yew, rowan, hawthorn, crab apple, wild/bird cherry, blackthorn and traveller's joy. The oak, ash and elm would most likely have provided the main fuels for the fire as they provide long-lasting heat at relatively high temperatures. The remaining species were likely to have been used as kindling material for the fire.

There are several variables that affect the reconstruction of local woodland using charcoal assemblages; however, if the charcoal were to be used as a 'presence' indicator it can be assumed that as the fuel wood (in particular kindling material) was usually selected from local woodlands. These charcoal remains have also made it possible to suggest that the woodland in the close vicinity to the N18 burnt mound sites would have consisted of both alder-carr fen in waterlogged areas close to the sites and oak-ash climax community woodland upslope/on higher ground.

References

- Aitkinson, E and Aitkinson, M D 2002 *Sambucus nigra L. The Journal of Ecology*, 90 (5), 895-923.
- Anderberg, A-L 1994 *Atlas of Seeds: Part 4*. Swedish Museum of Natural History, Risbergs, Trycgeri AB, Uddevalla, Sweden.
- Asouti, E & Austin, P 2005 Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal macro-remains. *Environmental Archaeology* 10:1-18
- Austin, P J 2005 Analysis of wood charcoal macro-remains from Glanworth Castle, Co. Cork. Excavation No. E236. Unpublished palaeobotanical report.
- Bayley, D 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3653 Caheraphuca 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.
- Bayley, D 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3653 Caheraphuca 3-12. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.
- Bayley, D 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3722 Clooneen 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Behre, K-E 2008 Collected seeds and fruits from herbs as prehistoric food. *Vegetation History and Archaeobotany*, 17, 65-73.

Berggren, G 1981 *Atlas of Seeds: Part 3*. Swedish Museum of Natural History, Berlings, Arlöv, Sweden.

Cappers, R T J Bekker, R M and Gronigen, J E A 2006 *Digital Seed Atlas of the Netherlands*. Archaeological Studies 4, Barkhuis Publishing, Eelde, The Netherlands. www.seedatlas.nl.

Cutler, D F and Gale, R 2000 *Plants in Archaeology – Identification Manual of Artefacts of plant origin from Europe and the Mediterranean*, Westbury Scientific Publishing and Royal Botanic Gardens, Kew.

Delaney, S 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3984 Gortavoher 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Delaney, S 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E4037 Monreagh 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Grogan, E Johnston, P O'Donnell, L 2007 *The Bronze Age Landscapes of the Pipeline to the West: An Integrated Archaeological and Environmental Assessment*, Wordwell Ltd, Bray: Co Wicklow.

Heller, I Kienast, F Schoch, W Schweingruber, F H 2004 *Wood Anatomy of Central European Species* Online version: www.woodanatomy.ch.

Holland, J H 1919 Food and fodder plants. *Bulletin of Miscellaneous Information*, 112, 1-84.

Keepax, C A 1988 *Charcoal Analysis with Particular Reference to Archaeological Sites in Britain*. Unpublished PhD thesis, University of London.

Lyne, E 2009 Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3655 Rathwilladoon 4. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3712 Monreagh 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3717 Ballyline 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McNamara, S 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3720 Drumminacloghaun 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

McVean, D N 1953 *Alnus glutinosa* (L.) Gaertn. *The Journal of Ecology*, 41, 2, 447-466.

Molloy, K and O'Connell, M 1991 Palaeoecological investigations towards the reconstruction of woodland and land-use history at Lough Sheeauns, Connemara, western Ireland, 67, 75-113.

Nunan, J 2009a Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3713 Sranagalloon 1. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009b Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3715 Ballyline 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009c Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3716 Derrygarriff 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009d Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3897 Sranagalloon 3. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Nunan, J 2009e Archaeological Stratigraphic Report: N18 Gort to Crusheen Road Scheme A044, E3898 Gortaficka 1 and 2. Unpublished report prepared by Irish Archaeological Consultancy for Galway County Council.

Pearson, K L 1997 Nutrition and the Early-Medieval Diet. *Speculum*, 72 (1), 1-32.

Prins, F and Shackleton, C M 1992 Charcoal analysis and the "Principle of Least Effort" - A conceptual Model. *Journal of Archaeological Science*, 19, 631-637.

Rackham, O 1980 The medieval landscape of Essex. In Buckley, D G (ed.) *Archaeology in Essex to AD1500*. Council for British Archaeology, Research Report No. 34.

Scholtz, A 1986 *Palynological and Palaeobotanical Studies in the Southern Cape*, MA Thesis of Stellenbosch, Stellenbosch, South Africa.

Stace, C 1997 *A New British Flora*. Cambridge: Cambridge University Press.

Stuijts, I 2005 Wood and Charcoal Identification. In Gowen, M, O'Neill, J and Phillips, M, *The Lisheen Mine Archaeological Project 1996-1998*, Wordwell Ltd, Bray: Co Wicklow.

Timson, J 1966 *Polygonum hydropiper* L. *The Journal of Ecology*, 54, 3, 815-821.

Van der Verf, S 1991 The influence of coppicing on vegetation. *Vegetatio*, 92 (2), 97-110.

Wheeler, E A, Baas, P and Gasson, P E (eds) 1989 IAWA List of Microscopic Features for Hardwood Identification. *IAWA Bulletin* ns 10: 219-332.

Appendix

Table 8: Charcoal species identified from E3655 Rathwilladoon 4, Co Galway.

Sample Number			1	4
Fill Number			C3	C6
Cut Number			N/A	C5
Family	Species	Common Name		
Betulaceae	<i>Corylus avellana</i>	Hazel	1	8
	<i>Alnus glutinosa /Corylus avellana</i>	Alder/hazel	31	4
Fagaceae	<i>Quercus robur/ petraea</i>	Pedunculate/sessile oak	9	76
Oleaceae	<i>Fraxinus excelsior</i>	Common/European Ash	16	12
Roseaceae	<i>Maloideae</i> spp (<i>Crateagus monogyna/Sorbus</i> spp/ <i>Malus sylvestris</i>)	Hawthorn/rowan/ crab apple	1	
Ulmaceae	<i>Ulmus glabra</i>	Elm	1	
		Indeterminate	0	2
Total fragments identified:			59	100

Table 9: Plant macrofossil species identified from E3655 Rathwilladoon 4, Co Galway.

Sample Number			1
Fill Number			C3
Cut Number			N/A
Family	Species	Common Name	
Betulaceae	<i>Corylus avellana</i>	Hazelnut shell	1
Total macrofossils identified:			1

NB – All plant macrofossil material is carbonised unless otherwise stated.

PETROGRAPHICAL REPORT ON STONE SAMPLES TAKEN
DURING ARCHAEOLOGICAL EXCAVATIONS AT
RATHWILLADOON 4, CO. GALWAY, E3655

DR STEPHEN MANDAL MIAI PGEO

*CRDS Ltd
Unit 4 Dundrum Business Park,
Dundrum,
Dublin 14*

Introduction

This report is based on the macroscopic (hand specimen) examination of stone samples taken during archaeological excavations in advance of the N18 Gort to Crusheen Road Improvement Scheme. The purpose of the study was to identify the rock types from which the stone objects were made, to highlight potential sources for them, and to comment on their possible function. It is important to note that macroscopic petrographical studies have been considered of limited value in comparison to microscopic (thin section and geochemical analysis) studies. On the other hand, macroscopic studies provide an excellent preliminary assessment tool and have proven to be of considerable value in petrographical studies (e.g. see Mandal 1997; Cooney and Mandal 1998).

Solid Geology and Soils of the Site (see Figure 1)

The bedrock under the site consists of Lower Carboniferous Tubber Formation (TU) (see below).

The geology of the area is predominantly made up of Lower Carboniferous Age rocks. However, older rocks make up the west and southwest of the area; the oldest rocks in the area occur as inliers (areas of older rocks surrounded by younger rocks) of Ordovician age tuff, lavas and clastic sediments, known as the Caher Hill Formation (shown as CH on Figure 1). Silurian Age rocks also occur as inliers in the area, in the form of the Derryfadda Formation (DF), consisting of greywackes, siltstones and mudstones. These are stratigraphically overlain unconformably by the Upper Devonian to Lower Carboniferous Ayle River Formation (AR) of mudstones, siltstones and conglomerates. This formation marks the start of a conformable sequence making up much of the study area, comprising: the Lower Limestone Shale (LLS), sandstone, siltstone and thin limestone; the Ballysteen Formation (BA), fossiliferous dark-grey muddy limestone which includes in this area the Ballynash Member (BAbn), wavy-bedded cherty limestone and this shale; and the Waulsortian Limestones (WA), massive bedded lime-mudstone.

There is a minor gap in the sequence in this area, the next youngest rocks belonging to the Tubber Formation (TU), consisting of crinoidal and cherty limestone and dolomite and the Burren Formation (BU), consisting of pale grey clean skeletal limestone. Both of these formations contain numerous distinct members, all represented in the area. Each of the members consist of a distinctive type of limestone, for example, the Aillwee Member (lower) (BUal) of bedded and massive fossiliferous limestones.

These Lower Carboniferous rocks, which make up much of the Midlands of Ireland, represent the northward return of the sea at the end of the Devonian, c. 360 million years ago, owing to the opening of a new ocean to the south called the Palaeo-Tethys in what is now central Europe.

Bedrock is not generally exposed in the area; instead it is covered by boulder clay, which is the result of glacial action during the last glaciation. Drumlins - an elongated hill formed by glacial action - are common in the area. The soils of the area consist of shallow brown earths (Aalen et al. 1997).

Results

Site	Sample	Context	Notes		
Rathwilladoon 4	1	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Rathwilladoon 4	4	6	Decayed (angular blocks)	Angular blocks to rounded pebbles	Limestone; chert; quartzite, very coarse-grained; vein quartz; sandstone

Potential Sources

It is likely that the sources for all of the samples are local. There are abundant sources for limestone of all varieties in the Carboniferous succession. Sandstone, quartz sandstone and quartzite are most likely sourced within the Caher Hill Formation and / or Ayle River Formation. It is, however, important to note that these rock types were not necessarily sourced from bedrock, but could also have come from secondary sources, such as in the glacial tills / sub-soils at the site.

Discussion

While it is not possible to determine a definitive source for these stone samples based on macroscopic examination alone, it can be stated that these rock types are available locally in outcrop and within the glacial tills / sub-soils. It is therefore highly probable that the material in these samples were sourced in the immediate vicinity of the site.

A total of 38 samples were examined from sites across the N18 Gort to Crusheen scheme (Table 1). Of these 30 are clearly decayed; only 13 are clearly burnt. A total of 33 contain angular to sub-angular blocks of stone; 28 contain rounded to sub-rounded cobbles / pebbles. It is not possible to determine with a degree of certainty whether the material was used in its broken state, or if large blocks were deliberately broken. A total of 24 samples contain limestone and / or cherty limestone as their principal stone type. Of these, one (from Caheraphuca 3; E3653 sample 12) also contains quartzite and sandstone; eight others contain quartzite and three others contain sandstone. A total of 11 samples contain quartzite as their primary stone source; of these three contain limestone, one sandstone, and three both. Finally, three samples contain sandstone as the primary stone type, one (Gortaficka 1; E3898 sample 1) containing chert and one (Gortaficka 2; E3898 sample 8) containing limestone. Coarse grained sandstone and quartzite of these types are typical of burnt mound material. Limestone is however atypical of burnt mound material – fine grained rock types such as limestone do not absorb heat in the same manner as coarse rock types such as sandstone and dolerite (e.g. see Mandal 2004).

Bibliography

Aalen, F H A, Whelan, K and Stout, M 1997 *Atlas of the Irish Rural Landscape*. Cork University Press: Cork.

Cooney, G and Mandal, S 1998 *The Irish Stone Axe Project: Monograph 1*. Wordwell: Wicklow.

Mandal, S 1997 Striking the balance: the roles of petrography and geochemistry in stone axe studies in Ireland. *Archaeometry* 39(2), 289-308.

Mandal, S 2004 Petrographical Report on Stone Samples found during Archaeological Investigations relating to the Sligo Inner Relief Road (Licence No. 03E0535). *Unpublished report commissioned by ACS Ltd for the NRA.*

McConnell, B (ed), Pracht, M, Lees, A, Leake, B, Feely, M, Long, B and Morris, J 2004 *Geology of Galway Bay: to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 14.* Geological Survey of Ireland Publications. Westprint Ltd: Sligo.

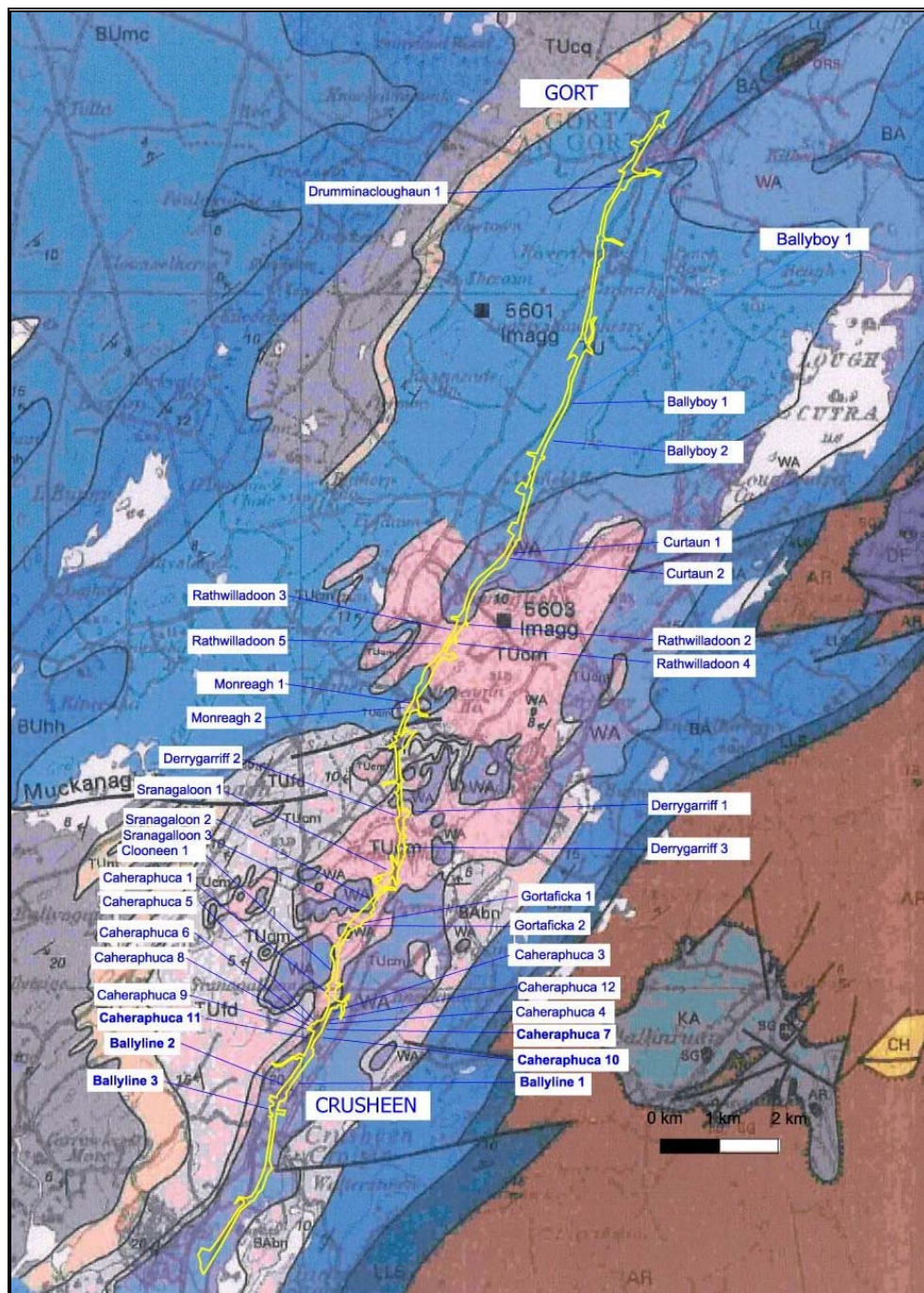


Figure 1 Geology of the area from Gort to Crusheen (after McConnell et al. 2004)

Table 1 Results of the Assessment of Samples for the Scheme

Site	License	Sample	Context	Notes		
Caheraphuca 10	E3653	1	1005	Not altered	Angular blocks;	Limestone; chert
Caheraphuca 10	E3653	4	1008	Altered	Angular (cherty limestone) to sub-angular (limestone) blocks	Limestone, cherty; limestone; some sandstone, coarse grained red quartz rich
Caheraphuca 10	E3653	5	1009	Not altered (limestone); altered (quartzite)	Angular (limestone) to sub-rounded (quartzite)	Limestone; chert; some quartzite, yellow
Caheraphuca 12	E3653	2	1204	Not altered / not burnt	Shattered blocks and rounded cobbles	Quartzite, very coarse
Caheraphuca 3	E3653	12	327	Altered / burnt soil	Rounded to angular pebbles	Limestone; quartzite; chert; sandstone
Caheraphuca 4	E3653	2	4	Heat altered	Angular blocks and broken rounded cobbles	Quartzite / sandstone; red-yellow-grey, coarse grained
Caheraphuca 4	E3653	3	5	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 5	E3653	1	504	Altered / burnt	Sub-angular blocks	Quartzite, very coarse grained yellow
Caheraphuca 6	E3653	1	605	Heat altered	Rounded / fractured cobbles	Limestone; some quartzite, coarse
Caheraphuca 6	E3653	3	604	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 6	E3653	7	617	Heat altered	Rounded to sub-rounded cobbles	Limestone; some quartzite
Caheraphuca 6	E3653	12	608	Heat altered	Angular to rounded cobbles	Quartzite, very coarse; sandstone, red quartz rich; minor amounts of limestone, calcite and chert
Caheraphuca 7	E3653	2	708	Decayed / burnt	Angular to sub-rounded blocks	Limestone; sandstone, coarse grained red
Caheraphuca 7	E3653	7	709	Not altered / not burnt	Angular blocks	Limestone, cherty; sandstone, coarse grained red quartz rich
Caheraphuca 8	E3653	48	827	Heat altered	Angular to rounded pebbles	Sandstone, coarse grained yellow
Caheraphuca 8	E3653	54	829	Altered / decayed	Angular (limestone) & sub-rounded (sandstone)	Limestone, cherty; sandstone, coarse grained red quartz rich
Caheraphuca 8	E3653	88	835	Altered / decayed	Angular	Quartzite, coarse grained yellow; limestone; chert
Caheraphuca 1B	E3654	15	29	Altered / decayed	Angular blocks	Limestone; chert
Rathwilladoon 4	E3655	1	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Rathwilladoon 4	E3655	4	6	Decayed (angular blocks)	Angular blocks to rounded pebbles	Limestone; chert; quartzite, very coarse grained; vein quartz; sandstone
Monreagh 2	E3712	13	25	Not altered / not burnt	Rounded to sub-rounded cobbles	Limestone; some quartzite
Monreagh 2	E3712	14	27	Not altered / not burnt	Rounded cobbles	Limestone; some quartzite
Sranagaloon 1	E3713	2	5	Altered / decayed	Angular to sub-rounded cobbles	Limestone

Ballyline 3	E3715	1	4	Altered	Rounded to sub-angular blocks and fractured cobbles	Quartzite, coarse grained red-yellow-grey
Ballyline 3	E3715	2	5	Altered	Rounded to sub-angular blocks and fractured cobbles	Quartzite, coarse grained red-yellow-grey
Ballyline 1	E3717	9	7	Not altered / not burnt	Angular to sub-rounded cobbles	Quartzite; sandstone, yellow red quartz rich; limestone; chert; vein quartz
Ballyline 2	E3717	1	25	Altered	Angular to sub-angular blocks	Quartzite, coarse grained yellow; minor amounts of limestone, cherty
Drumminacloghaun	E3720	2	3	Altered / decayed	Sub-rounded cobbles	Limestone
Clooneen 1	E3722	10	15	Heat altered / shattered	Angular cobbles	Quartzite, very coarse grained white; some limestone, cherty
Sranagaloon 3	E3897	1	3	Altered / decayed	Sub-rounded cobbles	Limestone
Sranagaloon 3	E3897	6	9	Decayed	Sub-angular blocks	Limestone
Sranagaloon 3	E3897	38	3	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Sranagaloon 3	E3897	40	34	Altered / decayed	Sub-rounded cobbles	Limestone; some chert
Sranagaloon 3	E3897	41	8	Heat altered	Sub-angular to sub-rounded blocks	Limestone
Gortaficka 1	E3898	1	3	Altered / burnt	Angular to sub-rounded cobbles	Sandstone, coarse grained yellow-red quartz rich; some chert
Gortaficka 2	E3898	8	20	Altered / decayed	Sub-angular to sub-rounded blocks	Sandstone, coarse grained yellow quartz rich; some limestone; chert
Gortaficka 2	E3898	9	8	Altered / decayed	Angular blocks	Quartzite, very coarse grained; sandstone, yellow quartz rich; limestone, cherty
Derrygarriff 3	E3710	8	3	Altered	Sub-rounded to sub-angular cobbles	Limestone

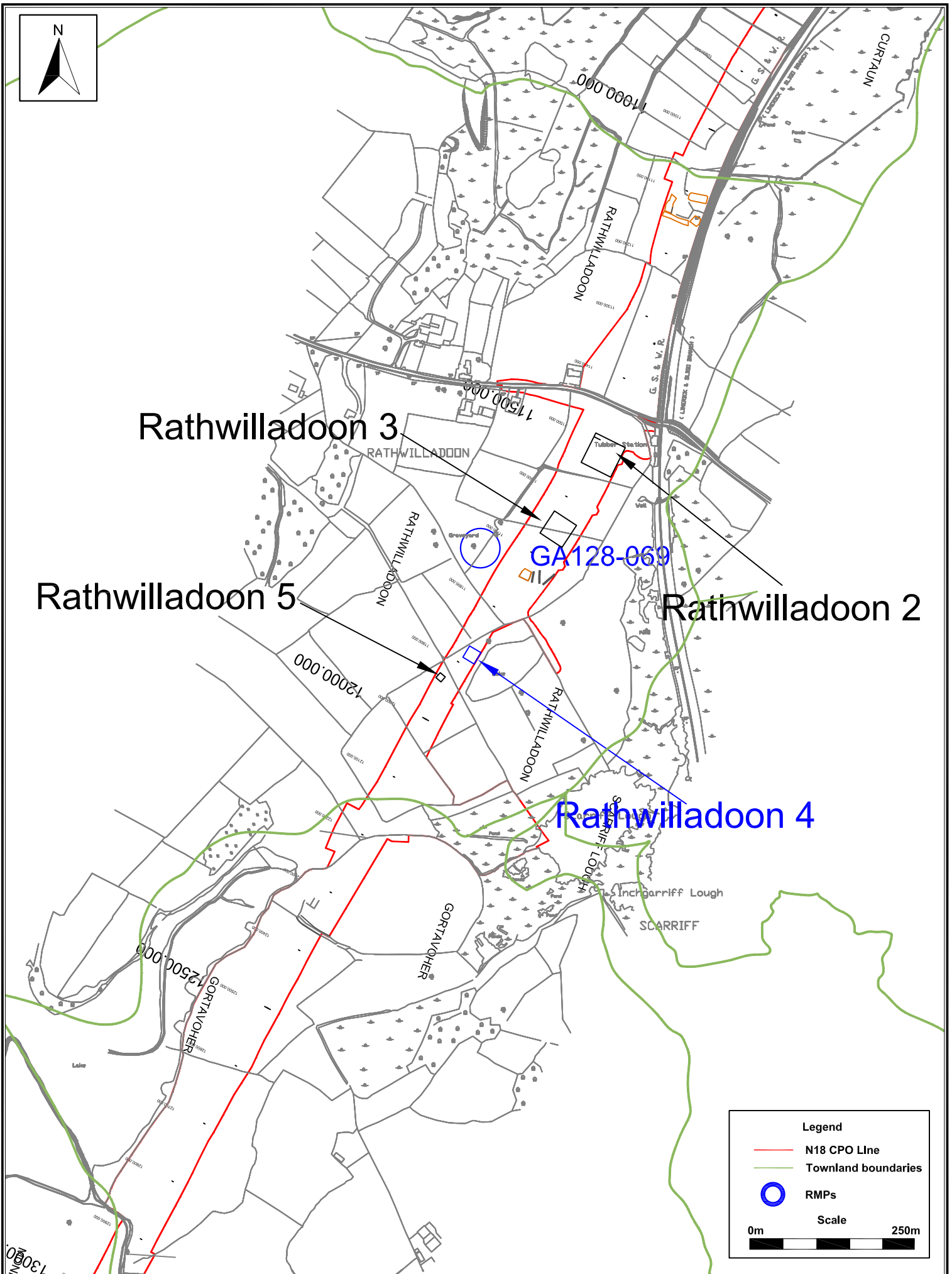
APPENDIX 3 LIST OF RMP SITES IN AREA

RMP No	Description
GA128-069	Graveyard
GA128-070	Ringfort – unclassified
GA128-070001	Souterrain

See Figure 2 for location.

APPENDIX 4 LIST OF N18 GORT TO CRUSHEEN SCHEME SITE NAMES

Site Name	Ministerial Direction No.	NMS Registration Number	Site Type
Drumminacloghaun 1	A044	E3720	Burnt mound
Ballyboy 1	A044	E3719	Ringditch
Ballyboy 2	A044	E3718	Ringditch
Curtaun	A044	E3721	Burnt mounds and early medieval cereal kilns
Rathwilladoon 2 & 3	A044	E3656	Prehistoric settlement
Rathwilladoon 4	A044	E3655	Burnt mound
Rathwilladoon 5	A044	E3657	Charcoal production kiln
Gortavoher 1	A044	E3904	Burnt mound
Monreagh 1 & 2	A044	E3712	Burnt mound
Monreagh 3	A044	E4037	Burnt mounds
Derrygarriff 1	A044	E3716	Burnt mound
Derrygarriff 2	A044	E3711	Metal production site
Derrygarriff 3	A044	E3710	Burnt mound
Sranagalloon 1	A044	E3713	Burnt mound
Sranagalloon 2/Site 146	A044	E3714	Enclosure
Sranagalloon 3	A044	E3897	Burnt mound
Gortaficka 1 & 2	A044	E3898	Burnt mounds
Clooneen 1	A044	E3722	Burnt mound
Caheraphuca 1	A044	E3654	Burnt mound
Caheraphuca 3 - 12	A044	E3653	Burnt mounds
Ballyline 1 & 2	A044	E3717	Burnt mounds
Ballyline 3	A044	E3715	Prehistoric pit



Legend

- N18 CPO Line
- Townland boundaries
- RMPs

Scale

0m 250m

Title: E3655 Rathwilladoon 4 showing Recorded Monuments with OSI background

Project: N18 Gort to Crusheen

Client: Galway County Council

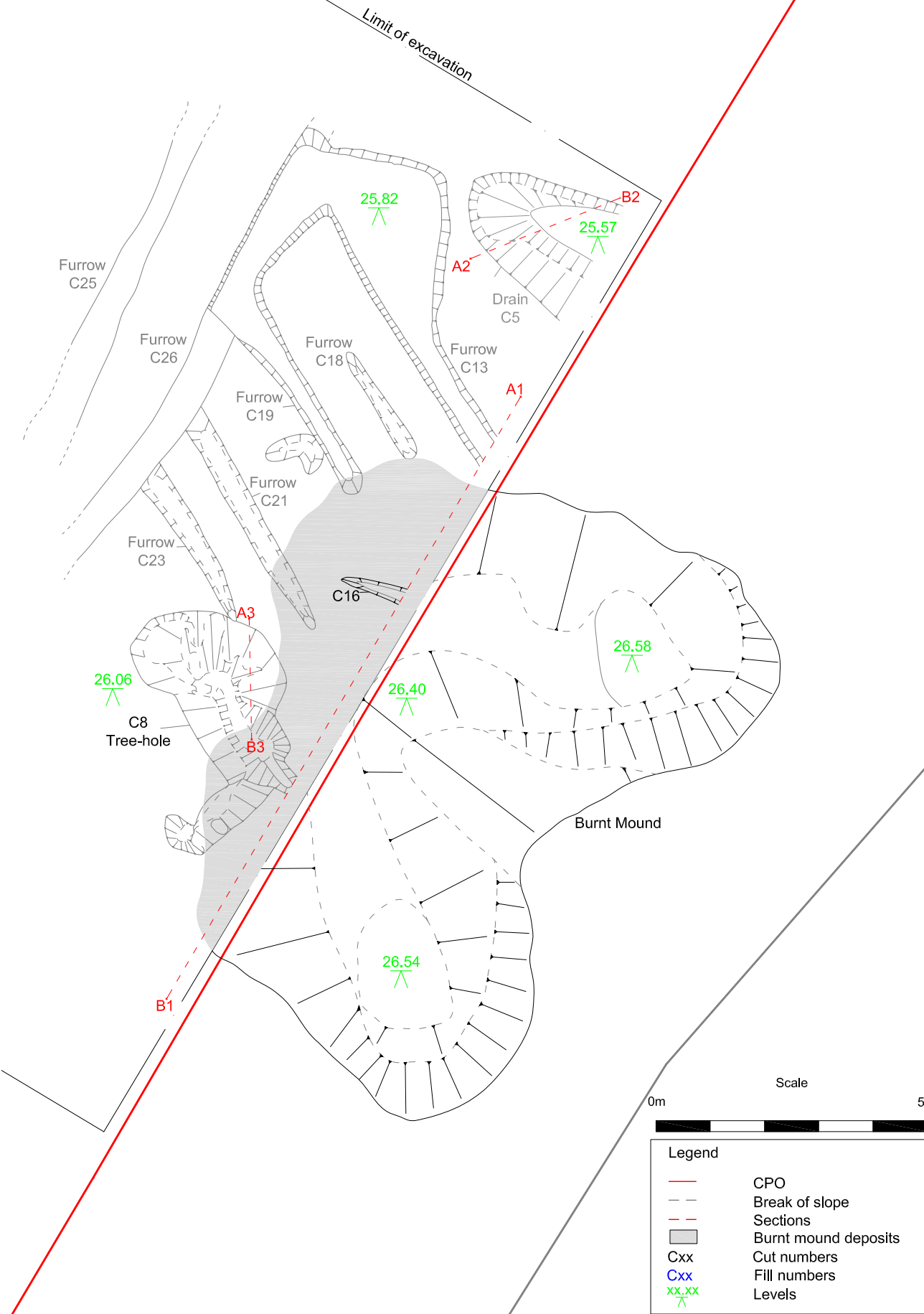
Scale: 1:10,000 @ A4

Date: 18/11/09

Produced by: G Kearney

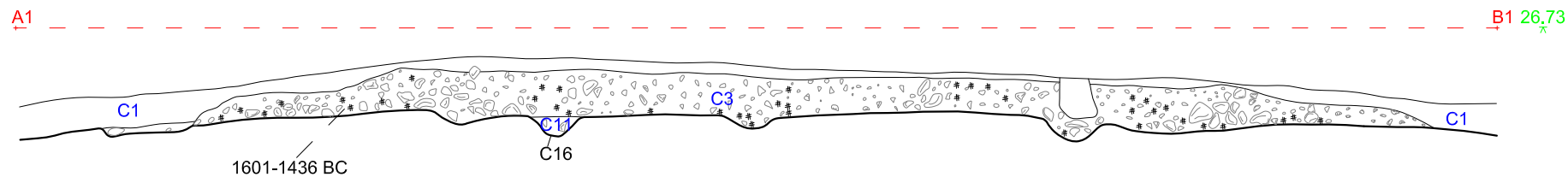
Job No: J2440

Figure No: 2



Legend	
	CPO
	Break of slope
	Sections
	Burnt mound deposits
	Cut numbers
	Fill numbers
	Levels

Northeast facing section of C16 (Burnt Mound)



Scale



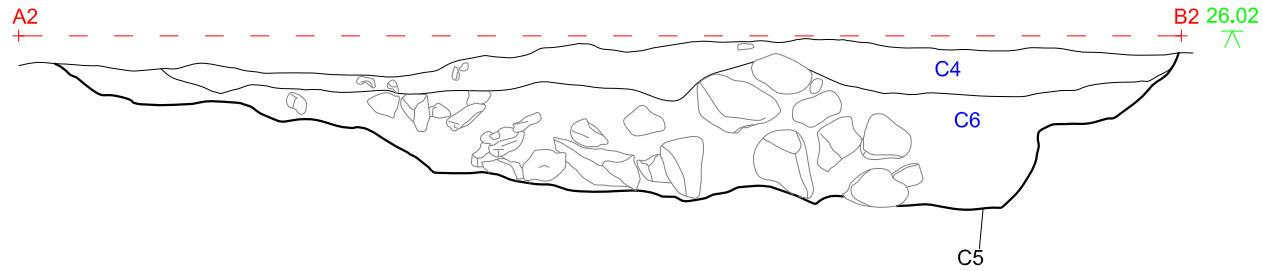
Legend	
Cxx	Cut numbers
Cxx	Fill numbers
	Stone
#	Charcoal
xx.xx	Levels - metres OD

IAC Irish Archaeological Consultancy

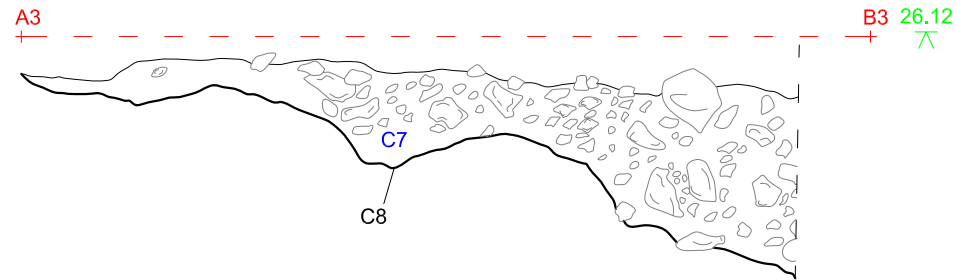
Title:	E3655 Rathwilladoon 4 - Northwest facing section of C3 (Burnt mound)
Project:	N18 Gort to Crusheen
Client:	Galway County Council

Scale:	1:50 @ A4
Date:	17/11/09
Produced by:	G Kearney
Job No:	J2440
Figure No:	4

South facing section of drain C5



West facing section of tree-hole C8




Scale

0m xxxm



Legend

- Cxx Cut numbers
- Cxx Fill numbers
-  Stone
- # Charcoal
- xx.xx Levels - metres OD

IAC Irish Archaeological
Consultancy

Title: E3655 Rathwilladoon 4 - Sections

Project: N18 Gort to Crusheen

Client: Galway County Council

Scale: 1:20 @ A4

Date: 17/11/09

Produced by: G Kearney

Job No: J2440

Figure No: 5